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PUBLICATIONS of the SOUTHERN FOREST EXPERIMENT STATION, 1962 THROUGH 1970

Louis E. Punch

SOUTHERN FOREST EXPERIMENT STATION
FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Contents

INTRODUCTION 1

GENERAL SILVICULTURE. Including descriptions of species and forested areas . 2

MANAGEMENT OF ESTABLISHED STANDS. Natural and planted stands: pruning, thinning, growth, costs, and returns. 5
- Pine-Hardwood 5
- Hardwood 8

CONTROL OF UNWANTED VEGETATION. Weeds in forest nurseries, brush on forest ranges, undesirable trees in both hardwood and pine-hardwood types 9

FIRE. Chiefly prevention and detection. See also **GENERAL SILVICULTURE, MANAGEMENT OF ESTABLISHED STANDS, SOILS AND SITE** 12

REGENERATION. Seed, nursery, planting and seeding, survival and growth until first merchantable products develop, protection from birds and rodents. See also **CONTROL OF UNWANTED VEGETATION, PHYSIOLOGY, RANGE, WILDLIFE, SOILS AND SITE, WATERSHED, DISEASES, INSECTS** . . 14
- General 14
- Pine 14
- Hardwood 24

GENETICS. All phases, including provenance. See also **PHYSIOLOGY** 27
- General 27
- Pine 29
- Hardwood 34

PHYSIOLOGY. See also **REGENERATION, SOILS AND SITE** 38

ECONOMICS. Economics of timber growing and utilization, including taxation and forest credit 39

RESOURCES AND PRODUCTION. Reports and analyses of forest resources and industries, including statistical reports from State and regional forest surveys 45
- Alabama 45
- Arkansas 45
- Louisiana 46
- Mississippi 46
- Oklahoma 47
- Tennessee 47
- Texas 47
- Regional 48

HARVEST AND MANUFACTURE. Methods, products, grading and grade yields, forest engineering, processing, and wood technology 51

MEASUREMENT. Forest biometry, volume and yield tables, instrumentation. See also **REGENERATION, HARVEST AND MANUFACTURE, RANGE, WILDLIFE, SOILS AND SITE, WATERSHED** 61

RANGE. Management—including costs and returns—of livestock and forage on forest lands, forage production and quality, coordination of livestock and timber, range measurements 64

WILDLIFE. Habitat management and coordination with timber; habitat measurements 67

SOILS AND SITE. Chiefly in relation to tree growth. See also **REGENERATION** . 71

WATERSHED. Rehabilitation and management, hydrologic and erosion processes, water yield, watershed measurements 76

DISEASES. Identification, prevention, and control 79
Trees 79
Products 85

INSECTS. Identification, prevention, and control 86
Trees 86
Products 92

MISCELLANEOUS. Chiefly research programs and forest policy 94

SERIAL PUBLICATIONS 97
Discontinued series 97
Occasional Papers 97
Forest Survey Releases 97
Southern Forestry Notes 97
Annual Reports 97

Current series 97
Research Papers 97
Resource Bulletins 98
Research Notes 99

INDEX OF AUTHORS 102

PUBLICATIONS of the SOUTHERN FOREST EXPERIMENT STATION, 1962 THROUGH 1970

Compiled by

Louis E. Punch

INTRODUCTION

In conjunction with two earlier lists, the present compilation provides a record of all publications of the Southern Forest Experiment Station.

The Station was established in July 1921, and its publications from that date through December 1954 were listed in Occasional Paper 108 (revision of January 1955). A first supplement to the Occasional Paper spanned the years from 1955 through 1961. This second supplement therefore extends the record through the first half-century of the Station's existence.

The subject-matter classification previously employed has been retained with a few modifications. Publications of the Forest Resources Research unit, formerly the Forest Survey, appear under a new head, RESOURCES AND PRODUCTION. Previously they were grouped under ECONOMICS. Headings for GENERAL SILVICULTURE and PHYSIOLOGY have been added, and SITE has been changed to SOILS AND SITE. Individual publications are recorded under one heading only. Since many touch on several topics, readers should consult all headings that appear related to their field of interest. The explanatory notes in the table of contents suggest some main lines of cross reference, and the index of authors may also be helpful.

Entries are accompanied by brief abstracts. Where two or more publications contain virtually the same information, the abstracts refer to the most comprehensive one, which generally will also be the most readily available. An inverted triangle (▼) marks publications that are out of print; most titles not so marked can be had free on request. The Station's address is T-10210 Federal Building, 701 Loyola Avenue, New Orleans, La. 70113.

All of the Station's previous serials — Occasional Papers, Forest Survey Releases, and Southern Forestry Notes — were discontinued at the close of 1962. They were replaced by three new series:

Research Papers
Resource Bulletins
Research Notes

The new series are uniform throughout the Forest Service; the Southern Station's contributions are prefixed by the code letters SO—for example, Research Paper SO-47. A complete list of the Station's publications in the new series, as well as the final numbers in the old series, will be found on the closing pages of this supplement.

Annual reports were discontinued after 1963.

Some of the publications deal with uses of pesticides no longer approved by the U.S. Department of Agriculture. Before any pesticide is applied, its current registration should be checked with responsible State or Federal authorities.

GENERAL SILVICULTURE

▼Allen, R. M.
1965. longleaf pine (pinus palustris mill.). *In* Silvics of Forest Trees of the United States, pp. 384-389, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼Beaufait, W. R., and Smith, L. F.
1965. black tupelo (nyssa sylvatica marsh.). *In* Silvics of Forest Trees of the United States, pp. 278-280, illus. U. S. Dep. Agr., Agr. Handbook 271

Burns, R. M.
1962. southern pines and sweetgums do not mix. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 141.
After 5 years, loblolly, slash, and shortleaf pines are overtopping sweetgums that were planted in mixture with them on uplands of north Mississippi.

▼Croker, T. C., Jr.
1968. ecology of an ideal forest community in the longleaf-slash pine region. *In* The ecology of southern forests, pp. 73-90. La. State Univ. 17th Annu. Forest. Symp. Proc. 1968. La. State Univ. Press.
The ideal community should comprise: (1) an overstory dominated by longleaf or slash pine, (2) an even-aged pure stand composed mainly of well-spaced dominants, (3) an understory largely of desirable grass and forb species, and (4) a sprinkling of selected hardwoods for game and beauty.

Croker, T. C., Jr.
1968. longleaf pine: an annotated bibliography, 1946 through 1967. USDA Forest Serv. Res. Pap. SO-35, 52 pp.
Lists 665 publications appearing since W. G. Wahlenberg compiled the bibliography for his book, Longleaf Pine.

▼Duffy, I. T.
1970. senna seymeria: forest freeloader and hothouse flop. Forests & People 20(2): 23, 41.
The first known green-root parasite of southern pines proved difficult to grow in the laboratory.

Farmer, R. E., Jr., and McKnight, J. S.
1967. populus: a bibliography of world literature, 1854-1963. U. S. Forest Serv. Res. Pap. SO-27, 132 pp.
A partially annotated list developed from citations furnished by the Commonwealth Forestry Bureau and arranged according to The Oxford System of Decimal Classification for Forestry.

Ferguson, E. R.
1970. eastern redcedar: an annotated bibliography. USDA Forest Serv. Res. Pap. SO-64, 21 p.
Lists more than 300 publications dealing with Juniperus virginiana *L.*

▼Ferguson, E. R., and Guttenberg, S.
1970. type conversion: key to increased output of southern pine. Forest Farmer 29(9): 6-7, 17-18.
Research can facilitate the task of converting millions of acres from inferior hardwoods to pine.

Ferguson, E. R., Lawson, E. R., Maple, W. R., and Mesavage, Clement.
1968. managing eastern redcedar. USDA Forest Serv. Res. Pap. SO-37, 14 pp.
Previous research and the results of recent studies in Arkansas indicate that eastern redcedar should be favored on many areas where growth of trees of other species is poor. Planting is feasible, and redcedar responds well to release and thinning.

▼Grano, C. X.
1965. shortleaf pine (pinus echinata mill.). *In* Silvics of Forest Trees of the United States, pp. 451-457, illus. U. S. Dep. Agr., Agr. Handbook 271.

Grano, C. X.
1967. growing loblolly and shortleaf pine in the midsouth. U. S. Dep. Agr. Farmers' Bull. 2102 (rev.), 27 pp., illus.
Revision of the 1956 edition.

▼Hebb, E. A.
1965. laurel oak (quercus laurifolia michx.). *In* Silvics of Forest Trees of the United States, pp. 581-583, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼Johnson, R. L., and Beaufait, W. R.
1965. swamp cottonwood (populus heterophylla l.). *In* Silvics of Forest Trees of the United States, pp. 535-537, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼Johnson, R. L., and Beaufait, W. R.
1965. water hickory (carya aquatica (michx. f.) nutt.). *In* Silvics of Forest Trees of the United States, pp. 136-138, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼Johnson, R. L., and Beaufait, W. R.
1965. water tupelo (nyssa aquatica l.). *In* Silvics of Forest Trees of the United States, pp. 284-286, illus. U. S. Dep. Agr., Agr. Handbook 271.

McKnight, J. S.
1963. Hardwood silviculture in tomorrow's forest. Seventh South. Forest Tree Impr. Conf. Proc. 1963: 9-11.
Silviculture in both natural and seeded or planted stands will be guided by site-species

relationships and take into consideration multiple use of the forest.

▼McKnight, J. S.
1963. On the way to intensive culture of cottonwood. Soc. Amer. Foresters Proc. 1962: 44-46.
Cottonwood stands can probably be made to grow 6 to 8 cords of high-quality wood per acre annually.

▼McKnight, J. S.
1965. BLACK WILLOW (SALIX NIGRA MARSH.). *In* Silvics of Forest Trees of the United States, pp. 650-652, illus. U. S. Dep. Agr., Agr. Handbook 271.

McKnight, J. S.
1965. HARDWOOD FORESTS OF THE SOUTH—USE, PROTECT, MANAGE. U. S. Forest Serv. Southern Forest Exp. Sta. and Southern Reg., 16 pp., illus. Other editions published in cooperation with Ala. Dep. Conserv., Div. Forest.; Arkansas State Forest. Comm.; Miss. Forest. Comm.; Miss. Forest. Assoc.; Delta Counc.; Hardwood Res. Counc.; Louisiana Forest. Comm. (Bull. 12 of Louisiana Forest. Comm.); Southern Hardwood Lumber Manufacturers Assoc.
Booklet illustrating principles and benefits of multiple-use management.

▼McKnight, J. S.
1965. INTENSIFY FORESTRY IN SOUTHERN HARDWOODS. Tech. Pap. Amer. Pulpwood Assoc., Oct., pp. 10-12. Pap. 65-24:(2.0).
Rising demands from pulp industries for hardwoods and increasing pressures for nonforest land uses make improved timber management necessary.

▼McKnight, J. S.
1965. SUGARBERRY (CELTIS LAEVIGATA WILLD.). *In* Silvics of Forest Trees of the United States, pp. 144-145, illus. U. S. Dep. Agr., Agr. Handbook 271.

McKnight, J. S.
1966. APPLICATION OF UNEVEN-AGED SILVICULTURE TO SOUTHERN HARDWOOD FORESTS. *In* Proc., Symp. on Hardwoods of Piedmont and Coastal Plain, pp. 61-64. Ga. Forest Res. Counc., Macon.
A form of group selection is adaptable to many natural stands, and enables the forester to meet changing market conditions while realizing maximum returns from the heterogeneous growing stock characteristic of present-day hardwood forests. But the silviculture must be intensive, and regulation of cut causes administrative difficulty.

▼McKnight, J. S.
1966. HARDWOOD FORESTERS EYE THE ATCHAFALAYA BASIN. Forests and People 16(3): 34-36, illus.
The basin, which comprises 800,000 acres in southern Louisiana, is a standby floodway of the Mississippi River. Improvement of drainage in its lower reaches would reduce siltation and ponding that is now interfering with both timber growth and wildlife habitat.

McKnight, J. S.
1966. UPLAND HARDWOOD SITUATION IN AREA I. The Unit, No. 110, pp. 9-10.
Consumption of nardwoods in the West Gulf States is increasing and the supply is dwindling, but future needs can be satisfied if landowners apply more and better silviculture. The expanding market for hardwood pulpwood may provide the needed economic incentive.

McKnight, J. S.
1968. ECOLOGY OF FOUR HARDWOOD SPECIES. *In* The ecology of southern forests, pp. 99-116. La. State Univ. 17th Annu. Forest. Symp. Proc. 1968. La. State Univ. Press.
The four species are cottonwood, sycamore, sweetgum, and cherrybark oak.

▼McKnight, J. S.
1968. ESTABLISHING GOOD, NEW STANDS OF SOUTHERN HARDWOODS. Natl. Hardwood Mag. 42(5): 46-47. *Also in* Wildlife in North Carolina 33(8): 8-9. 1969.
Depending on species and stand conditions, silvicultural systems for reproducing southern hardwoods are clearcutting, shelterwood cutting, group selection, and seed tree cutting. Some species may also be planted.

▼McKnight, J.S.
1968. GETTING THE MOST FROM SOUTHERN HARDWOOD STANDS. Natl. Hardwood Mag. 42(4): 44-45. *Also in* Wildlife in North Carolina 33(6): 24-25. 1969.
Protection, stand improvement, and thinning, if applied to a majority of southern hardwood stands, would probably assure a sustained supply of high-quality logs from stands already in existence.

McKnight, J. S.
1968. MEETING THE DEMANDS FOR SOUTHERN HARDWOODS. Natl. Hardwood Mag. 42(2): 38-39. *Also in* Wildlife in North Carolina 33(4): 16-17. 1969.
The steadily increasing demands for southern hardwoods can be met by improving forest management and log and wood marketing.

▼McKnight, J. S.
1968. SOUTHERN HARDWOOD FORESTS OF THE FUTURE. Natl. Hardwood Mag. 42(6): 44, 48-49. *Also in* Wildlife in North Carolina 33(10): 12-13. 1969.
The hope of growing sufficient hardwood lies in research.

▼McKnight, J. S., and Johnson, R. L.
1966. THE TECHNIQUES OF GROWING HARDWOODS. Forest Farmer 25(7): 59-68, illus.
Principles are briefed for the southern landowner: protection, improvement, choice of harvesting systems, site classification, and artificial regeneration.

▼Maisenhelder, L. C.
1965. EASTERN COTTONWOOD (POPULUS DELTOIDES BARTR. VAR. DELTOIDES). *In* Silvics of Forest Trees of the United States, pp. 514-518, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼Maisenhelder, L. C.
1965. NUTMEG HICKORY (CARYA MYRISTICAEFORMIS (MICHX. F.) NUTT.). *In* Silvics of Forest Trees of the United States, pp. 119-120, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼Maisenhelder, L. C.
1965. SASSAFRAS (SASSAFRAS ALBIDUM (NUTT.) NEES). *In* Silvics of Forest Trees of the United States,

pp. 654-656, illus. U. S. Dep. Agr., Agr. Handbook 271.

MAISENHELDER, L. C.
1970. MAGNOLIA. USDA Amer. Woods FS-245 rev., 7 p.
Description of Magnolia grandiflora *and* M. virginiana, *with information on supply and characteristics of the wood.*

▼ MANN, W. F., JR., GRELEN, H. E., AND WILLIAMSON, B. C.
1969. SEYMERIA CASSIOIDES, A PARASITIC WEED ON SLASH PINE. Forest Sci. 15: 318-319.
Senna seymeria, an annual figwort, is parasitic on roots of Pinus elliottii *in northwestern Florida. It weakens and sometimes kills pines up to 5 feet tall.*

▼ MAPLE, W. R.
1969. PRESCRIBED BURNING IN LONGLEAF FORESTS. Ala. Forest Prod. 12(7): 67, 69.
Though prescribed burns accomplish a number of desirable purposes, their long-term effects on the forest community are not fully understood.

▼ MIGNERY, A. L.
1965. POST OAK (QUERCUS STELLATA WANGENH.). *In* Silvics of Forest Trees of the United States, pp. 607-610, illus. U. S. Dep. Agr., Agr. Handbook 271.

MOEHRING, D. M.
1967. CONVERTING A PIN OAK FLAT TO PINE. U. S. Forest Serv. Res. Note SO-55, 3 pp., illus.
Planted loblolly pines survived satisfactorily and grew rapidly on a drained flat in southeast Arkansas.

▼ MORRIS, R. C.
1965. COMMON PERSIMMON (DIOSPYROS VIRGINIANA L.). *In* Silvics of Forest Trees of the United States, pp. 168-170, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼ MORRIS, R. C.
1965. NUTTALL OAK (QUERCUS NUTTALLII PALMER). *In* Silvics of Forest Trees of the United States, pp. 593-595, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼ MORRIS, R. C.
1965. OVERCUP OAK (QUERCUS LYRATA WALT.). *In* Silvics of Forest Trees of the United States, pp. 600-602, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼ SCHEER, R. L.
1965. OGEECHEE TUPELO (NYSSA OGECHE BARTR.). *In* Silvics of Forest Trees of the United States, pp. 281-283, illus. U. S. Dep. Agr., Agr. Handbook 271.

SMITH, L. F.
1967. EFFECTS OF SPACING AND SITE ON THE GROWTH AND YIELD OF PLANTED SLASH PINE. U. S. Forest Serv. Res. Note SO-63, 4 pp., illus.
Gross growth of 21-year-old slash pine in southern Mississippi averaged 38 cords per acre on a cutover site and 58 cords on an abandoned field. On both sites, yield was highest on plots with the closest spacings.

STRANSKY, J. J., AND DANIEL, H. E.
1964. REFERENCES ON EFFECTS OF FLOODING ON FOREST TREES. U. S. Forest Serv. Res. Note SO-12, 5 pp.
A bibliography.

STRANSKY, J. J., AND DUKE, W. B.
1964. SHELTER FOR TESTING DROUGHT-HARDINESS OF PLANTED SOUTHERN PINE SEEDLINGS. U. S. Forest Serv. Res. Note SO-11, 4 pp., illus.
A plastic-covered shelter simulates drought severe enough to cause seedling mortality. Air and soil temperatures, and relative humidity, are but slightly higher under the shelter than outside it.

STRANSKY, J. J., AND WILSON, D. R.
1964. TERMINAL ELONGATION OF LOBLOLLY AND SHORTLEAF PINE SEEDLINGS UNDER SOIL MOISTURE STRESS. Soil Sci. Soc. Amer. Proc. 28: 439-440, illus.
Height growth slowed when soil moisture tensions rose above 2 atmospheres and stopped when tensions exceeded 3.5 atm. Moisture content and water deficit of the leaves changed little before growth stopped.

▼ TOOLE, E. R.
1965. PECAN (CARYA ILLINOENSIS (WANGENH.) K. KOCH). *In* Silvics of Forest Trees of the United States, pp. 121-123, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼ TOOLE, E. R.
1965. WATER OAK (QUERCUS NIGRA L.). *In* Silvics of of Forest Trees of the United States, pp. 628-630, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼ TOOLE, E. R.
1965. WILLOW OAK (QUERCUS PHELLOS L.). *In* Silvics of Forest Trees of the United States, pp. 638-640, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼ VOZZO, J. A.
1969. ENDOTROPHIC MYCORRHIZAE FOUND ON POPULUS DELTOIDES. Forest Sci. 15: 158.
Mycorrhizae of eastern cottonwood are here shown to be endotrophic as well as ectotrophic.

▼ WOODS, F. W.
1965. LIVE OAK (QUERCUS VIRGINIANA MILL.). *In* Silvics of Forest Trees of the United States, pp. 584-587, illus. U. S. Dep. Agr., Agr. Handbook 271.

▼ ZILLGITT, W. M., AND STERNITZKE, H. S.
1966. THE SOUTH'S HARDWOODS: PRESENT AND PROSPECTIVE. *In* Proc., Symp. on Hardwoods of Piedmont and Coastal Plain, pp. 5-10. Ga. Forest Res. Counc., Macon.
Management must be intensified if southern hardwood forests in the year 2000 are to have sufficient growing stock to sustain the expected demand on them. Neither industry nor the public owns enough acreage to be decisive; the problems and opportunities are largely on other holdings.

MANAGEMENT OF ESTABLISHED STANDS

PINE–HARDWOOD

▼Bassett, J. R.
1964. DIAMETER GROWTH OF LOBLOLLY PINE TREES AS AFFECTED BY SOIL-MOISTURE AVAILABILITY. U. S. Forest Serv. Res. Raper SO-9, 7 pp., illus.
On plots thinned to 125 square feet of basal area per acre, diameter growth of 30-year-old trees was continuous when available water in the surface foot was above 65 percent. It stopped when available water was less than 40 percent. Trees on plots of 55 square feet of basal area per acre grew continuously.

▼Bassett, J. R.
1964. TREE GROWTH AS AFFECTED BY SOIL MOISTURE AVAILABILITY. Soil Sci. Soc. Amer. Proc. 28: 436-438. illus.
Merchantable growth on 106 acres of managed southern pine forest over a 21-year span was closely related to estimates of available moisture in the surface foot of soil during the growing seasons.

Bassett, J. R.
1966. PERIODIC CUBIC GROWTH IN NATURAL LOBLOLLY STANDS NEAR CROSSETT, ARKANSAS. U. S. Forest Serv. Res. Note SO-37, 4 pp., illus.
In 30- to 35-year-old stands, maximum volume was produced at densities of about 115 square feet of basal area per acre, but plots with 90 to 130 square feet produced within 10 cubic feet of maximum. On good sites, growth near Crossett culminated at lower densities than in the Southeastern U. S.

Bassett, J. R.
1966. THINNING LOBLOLLY PINE FROM ABOVE AND BELOW. U. S. Forest Serv. Res. Note SO-44, 3 pp.
Stands thinned from above or below, beginning at age 20, did not differ much in yield or size of residual trees at age 35.

Bassett, J. R.
1967. POLE PRODUCTION IN NATURAL LOBLOLLY PINE STANDS NEAR CROSSETT, ARKANSAS. U. S. Forest Serv. Res. Note SO-58, 5 pp.
Stumpage values from pulpwood and sawtimber were one-third less than from poles, pulpwood, and sawtimber.

Bassett, J. R.
1969. GROWTH OF WIDELY SPACED LOBLOLLY PINE. J. Forest. 67: 634-636.
By age 21 years, loblolly pine plots thinned to 10 square feet of basal area per acre at age 9 had yielded 88 cubic feet per acre annually. They supported 76 trees per acre, averaging 12.9 inches d.b.h. and containing 6,400 board feet of sawtimber. Plots thinned to 85 square feet of basal area had yielded 160 cubic feet per acre annually. They supported 251 trees per acre, averaging 7.8 inches d.b.h. and containing 300 board feet.

▼Bower, D. R.
1965. PRECOMMERCIAL THINNINGS ACCELERATE DIAMETER GROWTH OF LOBLOLLY PINE. J. Forest. 63: 210.
Heavy thinnings tripled diameter growth in dense 15-year-old stands in the Ouachita Mountains of Arkansas. They also accelerated basal area growth, but slowed self-pruning.

Bower, D. R., and Ferguson, E. R.
1968. UNDERSTORY REMOVAL IMPROVES SHORTLEAF PINE GROWTH. J. Forest. 66: 421-422.
In the Ouachita Mountains of Arkansas, complete removal of 33 square feet of hardwood understory basal area increased the growth of the shortleaf pine overstory by 31 percent. When only part of the understory was removed, the overstory's growth response was proportionally less.

Boyer, W. D.
1968. FOLIAGE WEIGHT AND STEM GROWTH OF LONGLEAF PINE. USDA Forest Serv. Res. Note 86, 2 pp.
In 45- to 60-year-old stands with 9 to 47 trees per acre, an average of 13.2 cubic feet of wood per year was grown per thousand pounds of new needles.

Burton, J. D.
1968. THINNING FROM ABOVE AND BELOW IN LOBLOLLY PINE. Southern Lumberman 217(2704): 185-186.
Crowded young stands may be thinned from above once or twice at ages 15 to 20 years; such thinnings will produce early revenue and will have no ill effects.

Chapman, R. C.
1963. Pruning labor in shortleaf-loblolly pine. Jour. Forestry 61: 144-145, illus.
Basal area of trees pruned was the single variable most highly correlated with time required for 1-log pruning in east Texas. Basal area of the stand and number of trees per acre also were influential. Pruning time can be estimated by point-sampling procedures.

Croker, T. C., Jr.
1962. FIFTEEN YEARS OF MANAGEMENT ON THE ESCAMBIA FARM FORESTRY FORTY. U. S. Forest Serv. South. Forest Expt. Sta., 4 pp.
Thirty-three MBF (Doyle) of saw logs, 96 cords of pulpwood, and 417 poles have been harvested from this 40-acre tract of longleaf pine. Growing stock, originally 11.8 cords per acre, has increased to 12.5 cords.

Croker, T. C.
1963. Sixteen years of management on the Escambia Farm Forestry Forty. U. S. Forest Serv. South. Forest Expt. Sta., 4 pp.
Thirty-six MBF (Doyle) of saw logs, 101 cords of pulpwood, and 440 poles have been harvested from this 40-acre tract of longleaf pine. Growing stock has been increasing.

Croker, T. C.
1965. seventeen years of management on the escambia farm forestry forty. U. S. Forest Serv. Southern Forest Exp. Sta., 4 pp.
Thirty-nine MBF (Doyle) of saw logs, 104 cords of pulpwood, and 440 poles have been harvested from this 40-acre tract of longleaf pine. Growing stock has been increasing.

Croker, T. C., Jr.
1966. eighteen years of management on the escambia farm forestry forty. U. S. Forest Serv. Southern Forest Exp. Sta., 4 pp.
Forty-two M b.f. (Doyle) of saw logs, 109 cords of pulpwood, and 440 poles have been harvested from this 40-acre tract of longleaf pine. Growing stock has been increasing.

Dell, T. R., and Collicott, L. V.
1968. growth in relation to density for slash pine plantations after first thinning. Forest Sci. 14: 7-12.
Growth, yield, and prospects were increased by an initial commercial thinning of severely cankered and crowded trees to a residual density of 100 square feet of basal area per acre. Considerable mortality occurred at a residual density of 125 square feet, and space was not fully utilized at 50 or 75 square feet. Height growth was unrelated to residual density.

Derr, H. J., and Enghardt, H. G.
1969. growth in a young managed longleaf pine plantation. J. Forest. 67: 501-504.
In a 30-year-old plantation in central Louisiana, gross volume growth over the last 10 years was as high as 2.7 cords per acre annually. Growth increased with increasing residual stocking over a wide range of basal areas. Yields have been best with the highest stocking, 100 square feet of basal area per acre.

Enghardt, Hans.
1962. yields high for planted slash pine in central louisiana. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 137.
A 7-acre plantation has produced 50.6 rough cords per acre at age 26½ years.

Enghardt, H. G.
1968. early thinnings—by individual trees or by rows? Proc., Symp. on Planted Southern Pines, pp. 84-91. USDA Southeast. Area, State and Priv. Forest., Atlanta, Ga.
Selection of individual trees is more effective than row thinning in stimulating stand growth. Row thinning, however, is more easily and cheaply done, and facilitates both conventional logging and use of mechanical tree harvesters.

▼ Enghardt, H. G.
1969. row or selection thinning? Forests and People 19(2): 34-35, 45.
Selection of individual trees is more effective than row thinning in stimulating stand growth. Row thinning, however, is more easily and cheaply done, and facilitates both conventional logging and use of mechanical tree harvesters.

▼ Enghardt, H. G.
1970. growth of 40-year-old planted loblolly pine. Forests & People 20(3): 38-41.
A test of plantation spacings near Woodworth, Louisiana, indicates that 6 by 6 or 8 by 8 feet may be best when multiple products—poles, plywood bolts, and saw logs—are sought. If pole quality is not important, 10- by 10-foot spacing may be preferable.

Enghardt, H. G., Smith, L. F., and Wells, O. O.
1969. pruning to reduce fusiform-rust damage not justified on young slash pines. USDA Forest Serv. Res. Note SO-87, 3 pp.
Neither early removal of cankered branches nor complete pruning to 60 percent of total height reduced fusiform-rust stem infection enough to warrant the treatments in large slash pine plantations.

▼ Farrar, R. M., Jr.
1967. how does your longleaf grow? South. Lumberman 215(2680): 126-127. *Also in* Ala. Forest Prod. 11(7): 61. 1968.
Near-maximum volume growth probably can be attained at basal areas of 60 to 80 square feet per acre.

Farrar, R. M., Jr.
1968. thinning longleaf pine on average sites. J. Forest. 66: 906-909.
Indications are that near-maximum periodic cubic volume growth and yield may be attained by thinning lightly and frequently from below to leave medium densities ranging from 55 to 65 percent of normal basal area per acre. Such practices should also result in increased yields of sawtimber-sized material and reduce the investment in growing stock.

Grano, C. X.
1969. precommercial thinning of loblolly pine. J. Forest. 67: 825-827.
Machine and hand thinnings beginning at age 7 years increased height growth and yield. Probably precommercial thinnings should be made (by machine) at age 2 or 3, and to at least an 8- by 8-foot spacing.

Mignery, A. L.
1966. small woodland management demonstration in southeastern tennessee. KTG J. 6 (3): 6-7, 10, illus.
A 52-acre tract near Sewanee has been intensively managed since 1958; 30 acres are low-grade cutover plateau stands of oak and hickory, and the remainder is on a cove site.

Moehring, D. M.
1966. diameter growth and foliar nitrogen in

FERTILIZED LOBLOLLY PINES. U. S. Forest Serv. Res. Note SO-43, 3 pp., illus.

One or two annual applications of nitrogen to an 8-year-old loblolly pine plantation increased diameter growth of the trees and the amount of nitrogen in the foliage. But neither response extended beyond 2 years after the last application.

Neelands, R. W.

1963. Farm forestry showcase. Forest Farmer 22(8): 22-23, illus.

See second entry below.

▼ Neelands, R. W.

1963. Farm forests are bonus crops. South. Lumberman 206(2572): 38, 40-41, illus.

See entry below.

▼ Neelands, R. W., and Reynolds, R. R.

1963. Farm forests are bonus crops. Amer. Forests 69(6): 9, 46-47, illus.

For 25 years the Crossett Farm Forestry Forties have been demonstrating the timber-growing possibilities of small woodlands.

▼ NELSON, T. C.

1970. INFLUENCE OF THINNING GRADE AND THINNING METHOD ON STAND INCREMENT IN THE SOUTHERN PINES. *In* Thinning and mechanization, p. 110-117. Proc., IUFRO Meet. Stockholm.

Light, frequent thinnings commencing at an early age appear best for maximizing both quantity and quality of growth and yield.

▼ NELSON, T. C.

1970. INFLUENCE OF THINNING ON RISKS IN THE SOUTHERN PINERY. *In* Thinning and mechanization, p. 163-168. Proc., IUFRO Meet. Stockholm.

Thinning of southern pines often increases the risks of damage by diseases, insects, glaze, and wind.

REYNOLDS, R. R.

1964. FARM FORESTRY AT THE CROSSETT EXPERIMENTAL FOREST. U. S. Forest Serv. South. Forest Expt. Sta., 4 pp.

1964 cutting records, Crossett Farm Forestry Forties.

REYNOLDS, R. R.

1966. 1965 HARVEST, CROSSETT FARM FORESTRY FORTIES. U. S. Forest Serv. Res. Note SO-29, 4 pp. *Also as* 1965 HARVEST: CROSSETT FARM FORESTRY FORTIES. Forest Farmer 25(12): 8-9, 14, illus.

Twenty-eighth annual cut from the good forty, twenty-seventh from the poor forty.

REYNOLDS, R. R.

1966. 1966 HARVEST, CROSSETT FARM FORESTRY FORTIES. U. S. Forest Serv. Res. Note SO-47, 4 pp.

Twenty-ninth annual cut from the good forty, twenty-eighth from the poor forty.

REYNOLDS, R. R.

1967. NATURAL PRUNING. Forest Farmer 26(6): 8-9, 18, illus.

On 15-year loblolly pines in southern Arkansas, an average of 10.9 years elapsed between the death and disintegration of a branch and overgrowth of the resulting knot.

REYNOLDS, R. R.

1969. MANAGEMENT OF SOUTHERN PINE FOR SIZE AND QUALITY. Forests and People 19(1): 22-23, 44-45.

In the West Gulf region, demand for large, high-quality pine logs will likely be greater in the future than in the past, and stumpage prices should be excellent.

REYNOLDS, R. R.

1969. TWENTY-NINE YEARS OF SELECTION TIMBER MANAGEMENT ON THE CROSSETT EXPERIMENTAL FOREST. USDA Forest Serv. Res. Pap. SO-40, 19 pp.

Growth in shortleaf-loblolly pine stands managed by the single-tree selection system has been equal to 8.6 percent annually.

REYNOLDS, R. R., and RAWLS, I. W.

1962. AFTER 25 YEARS ON THE CROSSETT FARM FORESTRY FORTIES. U. S. Forest Serv. South. Forest Expt. Sta., 4 pp., illus.

On the so-called poor forty, which was badly understocked 25 years ago, growing stock has been more than doubled even though stumpage worth $6,400 has been harvested. A well-stocked forty has yielded stumpage returns of $10,800.

▼ Reynolds, R. R., and Rawls, I. W.

1963. 1963 cutting record, Crossett Farm Forestry Forties. U. S. Forest Serv. South. Forest Expt. Sta., 4 pp.

From 1937 to 1963, stumpage worth $11,700 was cut from a well-stocked 40-acre tract, while a 34-acre stand that originally was badly understocked yielded $7,000 of stumpage.

SHOULDERS, EUGENE.

1967. GROWTH OF SLASH AND LONGLEAF PINES AFTER CULTIVATION, FERTILIZATION, AND THINNING. U. S. Forest Serv. Res. Note SO-59, 3 pp.

Volume growth of pulpwood and saw-log size trees was decreased by disking and heavy thinning and increased by fertilization. Diameter growth was increased by fertilization and heavy thinning but decreased by disking.

SHOULDERS, E.

1970. GROWTH AND YIELD OF A MIXED LOBLOLLY-SLASH PINE PLANTATION. USDA Forest Serv. Res. Note SO-99, 4 p.

Loblolly and slash pines grew at equal rates from ages 23 to 38 years, if allowance is made for initial differences in average diameter at age 23. Annual growth during the 15 years averaged 151 cubic feet per acre.

WAKELEY, P. C.

1969. SINGLE COMMERCIAL THINNINGS IN VARIOUSLY SPACED SLASH AND LOBLOLLY PINE PLANTATIONS. USDA Forest Serv. Res. Pap. SO-48, 12 pp.

Unthinned checks and light and heavy thinnings from below were compared in stands planted at 8- by 8-, 6- by 6-, and 5- by 5-foot spacings. Neither at stand age 30 years in slash pine nor at stand age 34 in loblolly did either live pulpwood volumes or total pulpwood yields vary

significantly among the three thinning treatments within any one spacing.

▼ WAKELEY, P. C.
1970. SINGLE COMMERCIAL THINNINGS IN SLASH AND LOBLOLLY PINES. J. Forest. 68: 223.
Unthinned checks and light and heavy thinnings from below were compared in stands planted at 8- by 8-, 6- by 6-, and 5- by 5-foot spacings. Neither at stand age 30 years in slash pine nor at stand age 34 in loblolly did either live pulpwood volumes or total pulpwood yields vary significantly among the three thinning treatments within any one spacing. Total pulpwood yields were 1.7 to 20.3 percent greater in the thinned plots at 5 by 5 than in the unthinned plots at 8 by 8, but these gains had been obtained at estimated 145 to 172 percent greater costs for planting, plus the costs of labor subsequently required for thinning.

▼Williston, H. L.
1963. Early yield of erosion-control plantations in north Mississippi. U. S. Forest Serv. Res. Note SO-1, 7 pp., illus. South. Forest Expt. Sta., New Orleans, La.
Survival of pulpwood-size pine plantations on eroded sites averaged 38 percent in loblolly, 48 in shortleaf, and 29 in slash. Annual growth per acre had been 0.89 cord for loblolly, 0.58 for shortleaf, and 0.88 for slash. Form class was 2 to 3 points better in loblolly than in shortleaf.

▼WILLISTON, H. L.
1966. STAND SURVIVAL AND EXPECTED YIELD ACCORDING TO STOCKING LEVEL. Proc., Direct Seeding Workshops, Alexandria, La., and Tallahassee, Fla., pp. 51-57. U. S. Forest Serv., Atlanta, Ga.
A survey of erosion-control plantations in north Mississippi yielded tables showing volumes of loblolly and shortleaf pines in terms of height of dominants and number of trees and basal area per acre.

▼WILLISTON, H. L.
1967. GROWTH OF PINE PLANTED FOR EROSION CONTROL IN NORTH MISSISSIPPI. U. S. Forest Serv. Res. Note SO-67, 4 pp., illus.
In plantations averaging 26 years old, annual net growth for the life of the stands was 1.08 cords per acre for loblolly and 0.77 cord for shortleaf. Growth to age 21 had been 0.89 cord for loblolly and 0.58 for shortleaf.

▼WILLISTON, H. L.
1967. THINNING DESIRABLE IN LOBLOLLY PINE PLANTATIONS IN WEST TENNESSEE. U. S. Forest Serv. Res. Note SO-61, 7 pp., illus.
Thinning was economically attractive in 29-year pulpwood rotations and appeared necessary in longer rotations. In 10 years following the first thinning at age 19, growth was independent of residual basal areas within the range tested—67 to 174 square feet per acre.

WILLISTON, H. L.
1967. YIELDS FROM YAZOO-LITTLE TALLAHATCHIE PLANTATIONS. *In* Harvesting Pine Plantations on Erosive Soils Conf. Proc. 1967: 21-25. Southeast. Area, State and Priv. Forest., U. S. Forest Serv., Atlanta, Ga.
Many of the plantations have reached pulpwood size, and owners are tempted to clearcut. If the watersheds are to be protected, owners must be shown why it would be profitable to make three or four thinnings for revenue and regenerate the stands at 35 to 40 years of age.

WILLISTON, H. L.
1969. UNMANAGED GROWTH IN NORTH MISSISSIPPI UPLANDS. USDA Forest Serv. Res. Note SO-90, 4 pp.
In stands that have been protected from fire and cutting since the middle 1930's, but not otherwise managed, annual growth has averaged but 10 to 30 cubic feet per acre—largely because of cull competition and poor species composition.

▼WILLISTON, H. L., and MACNAUGHTON, V. B.
1962. TIMBER MANAGEMENT GUIDE FOR YAZOO-LITTLE TALLAHATCHIE FLOOD PREVENTION PROJECT. U. S. Forest Serv. and U. S. Soil Conserv. Serv., 42 pp., illus.
Recommendations for managing forests on highly erosive soils of north Mississippi.

YOCOM, H. A.
1966. FIFTEEN YEARS OF MANAGEMENT ON A SMALL ALABAMA FOREST. Ala. Forest Prod. 9(7): 6-7, illus.
While growing stock was being increased from 1,023 to 1,199 cubic feet per acre, a pine stand near Birmingham yielded stumpage worth $2.11 per acre annually.

HARDWOOD

▼BROADFOOT, W. M.
1964. HARDWOODS RESPOND TO IRRIGATION. Jour. Forestry 62: 579.
Radial growth of several southern hardwood species was increased by irrigation.

BROADFOOT, W. M.
1966. FIVE YEARS OF NITROGEN FERTILIZATION IN A SWEETGUM-OAK STAND. U. S. Forest Serv. Res. Note SO-34, 3 pp., illus.
Diameter and height growth were significantly increased in a 20-year-old sweetgum-oak stand by annual surface application of ammonium nitrate and of complete N-P-K fertilizer. Nitrogen fertilization significantly increased the nitrogen content of foliage. With increasing nitrate application, exchangeable potassium in the soil 1 year after treatment decreased.

BROADFOOT, W. M.
1967. SHALLOW-WATER IMPOUNDMENT INCREASES SOIL MOISTURE AND GROWTH OF HARDWOODS. Soil Sci. Soc. Amer. Proc. 31: 562-564, illus.
Impounding winter and spring rainwater until July 1 increased soil moisture content during the remainder of the season and improved radial growth of southern hardwood stands on a Sharkey clay site.

▼Broadfoot, W. M., and Ike, A. F.
1967. Fertilizing southern hardwoods. Ala. Forest Prod. 10(7): 41, 43, 45, illus.
Fertilizing stimulated growth of eastern cottonwood, sweetgum, water and willow oak, yellow-poplar, and sycamore. In most cases, N appeared to be the key element.

Hedlund, Arnold.
1964. Epicormic branching in north Louisiana delta. U. S. Forest Serv. Res. Note SO-8, 3 pp., illus.
Epicormic branching was found on the second log of 72 percent of the saw-log size hardwoods. It was most frequent in stands with basal areas below 75 square feet per acre.

Johnson, R. L.
1968. Thinning improves growth in stagnated sweetgum stands. USDA Forest Serv. Res. Note SO-82, 5 pp.
From a starting basal area of about 120 square feet per acre, selective thinning to approximately 70 square feet maximized cubic-foot growth over a 10-year period.

Johnson, R. L., and Krinard, R. M.
1965. Tips for managing drought-stricken cottonwoods along the lower Mississippi River. U. S. Forest Serv. Res. Note SO-24, 4 pp., illus.
Cottonwoods with more than two-thirds of their crowns affected by dieback are unlikely to survive, and therefore should be marked for early cutting. Trees with less than one-third dieback are likely to recover. Those in intermediate dieback classes should be cut if their crowns are small or if a main leader or major branch is dead.

Johnson, R. L., and McKnight, J. S.
1969. Benefits from thinning black willow. USDA Forest Serv. Res. Note SO-89, 6 pp.
In 18- and 24-year-old stands along the Mississippi River, thinning increased both volume and diameter growth.

Krinard, R. M., and Johnson. R. L.
1964. Cuttings improve hardwood growth. Miss. Farm Res. 27(9): 1, 8. *Also as* Improvement cutting betters growth and quality of hardwoods. Miss. Agr. Expt. Sta. Inform. Sheet 863, 2 pp.
On a slackwater site in Mississippi, plots given a heavy improvement cut in 1940 now surpass uncut plots in basal area and volume of high-quality trees.

McKnight, J. S.
1967. A new look at hardwood for pulping. Pulp and Pap. 41(14): 83-84.
Though some southern hardwoods can be grown exclusively for pulpwood on very short rotations, it appears that all species will yield greatest stumpage returns if the rotation is long enough for lumber and veneer logs, with pulpwood from thinnings.

Putnam, J. A., and McKnight, J. S.
1965. Southern hardwoods can be managed. Auburn Univ. Hardwood Short Course Proc. 1964: 1-12.
Continuing demand for sawtimber and increasing use of hardwoods for pulp are powerful incentives to hardwood silviculture. Stand improvement in most southern hardwood forests encourages regeneration and increases rate of stand development.

CONTROL OF UNWANTED VEGETATION

Brady, H. A.
1969. Herbicide mixtures promising for hardwood control by foliar spraying. South. Weed Conf. Proc. 22: 245-250.
In tests on hardwoods of 10 species in central Louisiana, the effects of two or more herbicides were frequently additive and sometimes appeared synergistic.

Brady, H. A.
1969. Light intensity and the absorption and translocation of 2,4,5-T by woody plants. Weed Sci. 17: 320-322.
Absorption varied more than 20 percent in four woody species when light intensity was increased from 40 to 4,000 foot-candles. The changes in intensity affected translocation in post oak and water oak, but not in longleaf pine or American holly.

Brady, H. A.
1970. Ammonium nitrate and phosphoric acid increase 2,4,5-T absorption by tree leaves. Weed Sci. 18: 204-206.
Addition of ammonium nitrate greatly increased absorption of 2,4,5-T by sweetgum, post oak, red maple, and loblolly pine. Phosphoric acid alone and mixed with ammonium nitrate caused less increase.

Brady, H. A.
1970. Fertilizers change susceptibility of hardwoods to 2,4,5-T. S. Weed Sci. Soc. Proc. 23: 230-233.
Susceptibilities of sweetgum, post oak, and red maple seedlings were altered by fertilizing with 200 pounds per acre of nitrogen, phosphorus, or both. Size and direction of response varied both by species and by fertilizer treatment.

BRADY, H. A.

1970. HIGH TEMPERATURE BOOSTS 2,4,5-T ACTIVITY IN WOODY PLANTS. S. Weed Sci. Soc. Proc. 23: 234-236.

Plants absorbed more 2,4,5-T ester at 95 than at 55° F. In sweetgum, post oak, water oak, and bitter pecan more of the herbicide was also translocated to the roots at the higher temperature. In sumac, red maple, and loblolly pine more was moved to the roots at 55°.

BRADY, H. A., AND PEEVY, F. A.

1968. DIMETHYL SULFOXIDE FAILS TO INCREASE HARDWOOD KILLS BY HERBICIDES. Southern Weed Conf. Proc. 21: 218-221.

Whether they were sprayed or injected, herbicide formulations containing from 1 to 75 percent DMSO by volume achieved no better top-kills than conventional oil-water emulsions.

BRADY, H. A., PEEVY, F. A., AND BURNS, P. Y.

1969. ERRATIC RESULTS FROM AERIAL SPRAYING OF MIDSOUTH HARDWOODS. J. Forest. 67: 393-396.

Aerially applied herbicides cannot be recommended for cull hardwood control. Near Alexandria, Louisiana, hardwoods were satisfactorily controlled in only one of four trials.

BURTON, J. D.

1962. DORMANT-SEASON MIST BLOWING: IT DIDN'T WORK. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 137.

Four 2,4,5-T formulations were tested in Tennessee: 2 or 4 pounds acid equivalent in 5 or 10 gallons of diesel oil per acre.

▼GRANO, C. X.

1970. CONTROLLING SMALL HARDWOODS WITH REPEATED PRESCRIBED BURNS. Forest Farmer 29(11): 9, 16.

See entry below.

GRANO, C. X.

1970. ERADICATING UNDERSTORY HARDWOODS BY REPEATED PRESCRIBED BURNING. USDA Forest Serv. Res. Pap. SO-56, 11 p.

In a loblolly-shortleaf pine stand containing abundant litter, one winter fire killed 94 percent of the stems of understory hardwoods up to 3.5 inches in diameter at the base. Prolific sprouting ensued. Eleven annual summer burns eliminated sprouting on 85 percent of the rootstocks, and seven biennial summer burns eliminated sprouting on 59 percent of them.

GRANO, C. X.

1970. SMALL HARDWOODS REDUCE GROWTH OF PINE OVERSTORY. USDA Forest Serv. Res. Pap. SO-55, 9 p.

Dense understory hardwoods materially decreased the growth of a 53-year-old and a 47-year-old stand of loblolly and shortleaf pines. Over a 14-year period, hardwood eradication with chemicals increased average annual yield from the 53-year-old stand by 14.3 cubic feet, or 123 board-feet per acre. In the 47-year-old stand the average annual treatment advantage was 32.6 cubic feet, or 342 board feet per acre, over an 11-year period.

▼GRANO, C. X.

1970. UNDERSTORY HARDWOODS REDUCE GROWTH OF PINE SAWTIMBER. Forest Farmer 29(12): 9.

See entry above.

▼HALLS, L. K.

1966. BITTERWEED (HYMENOXYS ODORATA DC.). *In* Chemical Control of Range Weeds, p. 4. U. S. Dep. Agr. and U. S. Dep. Interior, 39 pp.

This plant, poisonous to sheep and cattle, can be controlled with a low-volatile ester of 2,4-D, applied as a spray.

▼HALLS, L. K.

1966. COMMON GALLBERRY (ILEX GLABRA [L.] GRAY). *In* Chemical Control of Range Weeds, pp. 21-22. U. S. Dep. Agr. and U. S. Dep. Interior, 39 pp.

Plants can be controlled with a low-volatile ester of 2,4,5-T in water, sprayed on the foliage in August.

▼HALLS, L. K.

1966. SAW-PALMETTO (SERENOA REPENS [BARTR.] SMALL). *In* Chemical Control of Range Weeds, pp. 37-38. U. S. Dep. Agr. and U. S. Dep. Interior, 39 pp.

2,4,5-T, dalapon, and erbon are effective controls.

▼KRINARD, R. M.

1964. WEED CONTROL IN DELTA COTTONWOOD PLANTATIONS. Miss. Farm Res. 27(5): 8, illus. *Also as* WEED CONTROL TRIALS IN COTTONWOOD PLANTATIONS. Miss. Agr. Expt. Sta. Inform. Sheet 854, 2 pp., illus.

Disking proved superior to chemical treatments and other methods.

KRINARD, R. M., AND JOHNSON, R. L.

1965. KILLING BITTER PECAN WITH UNDILUTED HERBICIDES. Southern Lumberman 211(2632): 152, illus.

Spring applications of undiluted 2,4-D, in jabs 5 inches apart at the rate of one-half milliliter per jab, will kill bitter pecans up to 13 inches in diameter.

▼MARTIN, J. W., AND CARTER, M. C.

1966. TOLERANCE OF COTTONWOOD TO CERTAIN HERBICIDES. Auburn Univ. Agr. Exp. Sta. Bull. 372, 17 pp.

Simazine at rates up to 12 pounds per acre, diuron up to 4 pounds, and diphenamid and dichlobenil up to 16 pounds were nontoxic to cottonwood seedlings when applied in a forest nursery prior to the emergence of weeds. In pots, lesser amounts of the first three chemicals were toxic. Of a number of chemicals tested, these four are the most promising for cottonwood because each controls a wide variety of weeds.

▼PEEVY, F. A.

1962. EVALUATION OF PLACEMENTS OF 2,4,5-T BASAL SPRAY FOR CONTROL OF BLACKJACK OAK. Weeds 10: 74-75.

Placements that did not wet the rootcollar and sprouting zone gave poor kills of roots.

▼Peevy, F. A.
1962. injecting undiluted silvicides for control of woody plants. South. Weed Conf. Proc. 15: 163-169.
Blackjack and post oaks may be killed with undiluted 2,4-D amine—0.5 ml. per injection in cuts spaced 3 inches apart, edge to edge, near the groundline. For hard-to-kill species like red oak and hickory, injections should be spaced 1 inch apart or undiluted 2,4,5-T amine should be used at rates of 1 ml. per injection in cuts 3 inches apart.

▼Peevy, F. A.
1963. Injecting undiluted 2,4-D amine to control woody plants. South. Weed Conf. Proc. 16: 257-262.
Best all-around treatment probably is 1 ml. in incisions 3 inches apart, edge-to-edge.

Peevy, F. A.
1963. Killing upland hardwoods with silvicides. Forest Farmer 22(6): 14-16, illus.
Summary of recommendations.

Peevy, F. A.
1964. reducing hardwood control costs by injecting undiluted 2,4-d amine. South. Weed Conf. Proc. 17: 232-239.
Tests in Louisiana during 1963 have resulted in prescriptions for killing various hardwoods in different seasons by injecting undiluted 2,4-D amine.

Peevy, F. A.
1965. cheaper hardwood control. Forest Farmer 24(11): 9, 14, illus. *Also as* a new cheaper method for killing unwanted hardwoods. Forests and People 15(2): 7, 38, 41, illus.
Undiluted 2,4-D amine, applied by metered injectors in widely spaced incisions, is cheaper and easier to use than diluted herbicides.

Peevy, F. A.
1966. interim recommendations for injecting hardwoods on bottom-land sites with undiluted 2,4-d amine. Southern Weed Conf. Proc. 19: 270-275.
One milliliter of 2,4-D per jab, at 5-inch spacings, is effective on most species in the growing season and also kills water oak and winged elm in winter.

Peevy, F. A.
1968. controlling upland southern hardwoods by injecting undiluted 2,4-d amine. J. Forest. 66: 483-487.
Injection is practical and economical; the optimum dosage varies by season of application, species, tree size, and spacing of incisions.

▼Peevy, F. A.
1968. injecting undiluted 2,4-d amine for control of bottom-land hardwoods. Southern Weed Conf. Proc. 21: 223-227.
A 1-ml. dose of undiluted 2,4-D, applied at a spacing of 5 inches between incisions, may be considered the present standard for killing cull hardwoods in southern bottom lands. Effectiveness varies with tree species and season of application.

Peevy, F. A.
1969. control of woody plants erratic with soil herbicides. South. Weed Conf. Proc. 22: 257-259.
In dosages of ¼, ½, and 1 g. per inch of d.b.h., eight soil herbicides were only partly effective on five hardwood species. Bromacil and isocil showed greatest promise.

Peevy, F. A.
1969. several herbicides and mixtures show promise for injection of cull hardwoods. South. Weed Conf. Proc. 22: 251-256.
Several chemicals show greater promise than 2,4-D when injected in undiluted form.

Peevy, F. A.
1970. banding soil herbicides not promising for hardwood control. S. Weed Sci. Soc. Proc. 23: 225-229.
Banding soil herbicides instead of broadcasting did not reduce the amounts required to kill hardwoods. Bromacil and picloram gave acceptable kills at rates of 10 pounds per acre. At a 5-pound rate, picloram gave marginal kills and bromacil was unsatisfactory. All treatments with fenuron were ineffective.

Peevy, F. A.
1970. site effect on herbicidal efficiency. S. Weed Sci. Soc. Proc. 23: 237-240.
Injected 2,4-D amine worked better on sweetgums in bottom lands than in uplands. On post oak and hickory, differences in effectiveness attributable to site were small and inconsistent for both injected and soil-applied herbicides.

Peevy, F. A., and Brady, H. A.
1968. mist blowing versus other methods of foliar spraying for hardwood control. Weed Sci. 16: 425-426.
In central Louisiana, mist blowing was about as effective as aerial spraying or high-volume ground spraying for control of hardwood brush.

Smith, L. F.
1963. Controlling shrubs on wet slash pine sites. U. S. Forest Serv. Res. Note SO-4, 2 pp. South. Forest Expt. Sta., New Orleans, La.
Cutting stems near groundline and spraying the fresh stumps with 2,4,5-T in diesel oil killed 99 percent of the plants within 2 years, but cost twice as much as a foliage spray with 2,4,5-T in water, which killed 66 percent.

Williston, H. L.
1962. hardwood brush control with foliar sprays. Miss. Farm Res. 25(4): 4-5.
Three formulations of 2,4,5-T, alone or in mixture with 2,4-D, damaged pine seedlings and failed to control brush. Chemicals were applied with ground equipment.

Yocom, H. A.
1962. more than one treatment may be needed to release underplanted pines. USDA Forest Serv. South. Forest Exp. Stn. South. For. Notes 140. *Also as* tip on hardwood control. Forest World 1(4): 49.

In a north Alabama stand where hardwoods were cut or girdled (but not treated with a silvicide) sprouts developed in such size and number as to interfere with underplanted pines.

YOCOM, H. A., AND BLOCKER, W. W.
1969. HERBICIDE INJECTIONS ON CULL HARDWOODS. Ark. Farm Res. 18(1): 7.
In the Arkansas mountains, an economical treatment is a 1.0-ml. dose of undiluted 2,4-D amine injected at 3-inch spacings.

FIRE

BAIRD, A. W.
1965. ATTITUDES AND CHARACTERISTICS OF FOREST RESIDENTS IN THREE MISSISSIPPI COUNTIES. Miss. State Univ. Soc. Sci. Res. Center Prelim. Rep. 8, 48 pp.
The sample counties are in an area where conservation agencies are cooperating with landowners in carrying out practices to prevent soil erosion. Ninety-one percent of all respondents expressed generally favorable attitudes toward conservation, the forest, and fire prevention.

▼ BAIRD, A. W., AND DOOLITTLE, M. L.
1969. RURAL RESIDENTS AND FOREST FIRE RISK: GUIDES TO FOREST FIRE PREVENTION. Miss. State Univ. Soc. Sci. Res. Cent. Rep. 29, 18 pp.
Interviews indicate need for greater coordination between fire-prevention agencies and cooperative local leaders. A person's membership in a conservation-oriented organization and his opinion about woods burners are likely to indicate his cooperativeness.

▼ BAIRD, A. W., AND KAUFMAN, H. F.
1967. AN EXPERIMENT IN THE PREVENTION OF MAN-CAUSED FIRES. Forest Farmer 26(4): 9, 20-23, illus.
The Southern Forest Experiment Station and the Social Science Research Center of Mississippi State University have begun cooperative research to learn why people set forest fires.

▼ BAIRD, A. W., ROBINSON, J. W., JR., AND JONES, A. R., JR.
1969. BELIEFS AND PRACTICES OF SELECTED RURAL RESIDENTS TOWARD FOREST CONSERVATION AND MANAGEMENT. Miss. State. Univ. Soc. Sci. Res. Cent. Rep. 28, 40 pp.
In a three-county area of north-central Mississippi, forest operators who tended to adopt recommended practices had more education than nonadopters, were more often in contact with agricultural and forestry agencies, had a higher level of living, belonged to more organizations, and had a longer tenure of residence. They also tended to have larger farms and more acreage in woodland, plus a more positive attitude toward forests and conservation.

BERTRAND, A. L., HEFFERNAN, W. D., WELCH, G. D., AND O'CARROLL, J. P.
1970. ATTITUDINAL PATTERNS PREVALENT IN A FOREST AREA WITH HIGH INCENDIARISM. La. Agr. Exp. Sta. Bull. 648, 20 p.
Interviews with heads of 259 households in an area in western Louisiana revealed a moderately favorable attitude toward forestry agencies; the area's fire record appeared to be the work of a small number of individuals.

COLE, L. W., AND KAUFMAN, H. F.
1966. SOCIO-ECONOMIC FACTORS AND FOREST FIRES IN MISSISSIPPI COUNTIES. Miss. State Univ. Social Sci. Res. Center Prelim. Rep. 14, 68 p.
Fire occurrence rates were closely related both to socio-economic factors and to forest types.

▼ DICKERSON, B. E., AND BERTRAND, A. L.
1969. POTENTIAL ROLES OF LOCAL OPINION LEADERS IN THE COMMUNICATION OF FOREST FIRE PREVENTION MESSAGES. La. Agr. Exp. Sta. Bull. 639, 20 pp.
Research in a rural southern community established that community opinion leaders definitely play communicator roles which have relevance for fire prevention programs.

▼ DOOLITTLE, M. L.
1968. FOREST FIRE PREVENTION—THE VITAL ROLE OF COMMUNITY LEADERS. USDA Forest Serv. Fire Contr. Notes 29(3): 11-12. *Also as* THE VITAL ROLE OF COMMUNITY LEADERS IN FOREST FIRE PREVENTION. Forest Farmer 28(1): 18, 26.
Success in fire-prevention programs may be related to the pattern of leadership in a community.

DOOLITTLE, M. L.
1969. FOREST FIRE OCCURRENCE IN THE SOUTH, 1956-1965. USDA Forest Serv. Res. Note SO-97.
Data for about 800 counties or districts under protection in 13 States.

FAHNESTOCK, G. R.
1962. LOW HUMIDITY WARNS OF BAD FIRE SITUATIONS. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 138.
Analysis of 2,200 winter fires in Texas showed that size and occurrence rates were greatest at low humidities. Fire size also was related to time between discovery and first attack, to wind speed, and to hour of discovery.

FAHNESTOCK, G. R.
1964. COMPUTERS CAN AID IN FIRE CONTROL. South. Lumberman 209(2609): 97-98, illus.
Computer analyses of reports on individual fires in Texas show how fire size and occurrence rates are related to weather and operational factors, and suggest how fire control can be improved.

▼ FAHNESTOCK, G. R.
1964. SOUTHERN FOREST FIRES: A SOCIAL CHALLENGE. Miss. State Univ. Social Sci. Res. Center Prelim. Rep. 2, 7 p. *Also in* USDA Forest Serv. Fire Control Notes 26(2): 10-12, 16. 1965.
Preventing forest fires in the South is a social problem; the Southern Forest Experiment Station is starting research on it.

FAHNESTOCK, G. R.
1965. FIRE PREVENTION IN THE SOUTH: A STUDY IN DIVERSITY. Soc. Amer. Forest. Proc. 1964: 58-60, illus.
People start 98 percent of the forest fires in the South, purposely setting about two-thirds. Reasons are closely related to the socio-economic history of the rural South. Research by the Southern Forest Experiment Station, Mississippi State University, and other cooperators aims at understanding and controlling the many physical and human factors that affect fire occurrence.

FAHNESTOCK, G. R.
1965. TEXAS FOREST FIRES IN RELATION TO WEATHER AND OTHER FACTORS. U. S. Forest Serv. Res. Pap. SO-16, 19 pp., illus.
Analysis of 2,297 fires during 1958-1960 showed that final size of nonincendiary fires varied directly with wind speed and attack time, and inversely with relative humidity and hour of discovery (between 10 a.m. and 6 p.m.). Relative humidity and Burning Index were the main factors that affected number of fires.

FAHNESTOCK, G. R., AND HARE, R. C.
1964. HEATING OF TREE TRUNKS IN SURFACE FIRES. Jour. Forestry 62: 799-805, illus.
Near the ground, external heating of pole-size longleaf pines was essentially identical in headfires and backfires; above 1 foot, temperatures were much higher in headfires. At all levels the lee side was heated more intensely than the windward. Temperatures were lower in bark fissures than on bark plates.

FERGUSON, E. R.
1962. 1962 SUMMER DROUGHT LOWERS MOISTURE IN LIVING FOLIAGE. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 142.
Though the foliage did not become readily flammable, reductions in moisture content increase the likelihood that fires will be intense and damage severe.

GRIESSMAN, B. E., AND BERTRAND, A. L.
1967. FACTORS RELATED TO COMMUNICATION OF FOREST FIRE PREVENTION MESSAGES. La. Agr. Exp. Sta. Bull. 623, 31 pp.
A study in selected rural communities.

GWINNER, M. W.
1964. ESTIMATING RELATIVE HUMIDITY FROM DEWPOINT DEPRESSIONS. Jour. Forestry 62: 407, illus.
Relative humidity decreases about one-half for each 18° F. increase in the difference between air temperature and dewpoint.

GWINNER, M. W.
1965. FOREST-FIRE DANGER AS RELATED TO AIRMASS IN THE OUACHITA MOUNTAINS. U. S. Forest Serv. Res. Note SO-21, 4 pp., illus.
In warm, moist Gulf airmasses, temperature and relative humidity on an exposed ridgetop were similar to those in a nearby valley. In cooler Canadian and Pacific airmasses, afternoon measurements at the two locations were about the same, but during the night the ridgetop averaged 8° F. warmer and 27 percentage points drier than the valley.

HARE, R. C.
1965. BARK SURFACE AND CAMBIUM TEMPERATURES IN SIMULATED FOREST FIRES. J. Forest. 63: 437-440, illus.
Exposure of lower trunks of trees to surface fires can be simulated by burning an oil-soaked wick wrapped around the trunk near the ground.

HARE, R. C.
1965. CHEMICAL TEST FOR FIRE DAMAGE. J. Forest. 63: 939.
Orthotolidine solution, which stains living but not dead tissue, aids evaluation of fire damage to trees.

HARE, R. C.
1965. CONTRIBUTION OF BARK TO FIRE RESISTANCE OF SOUTHERN TREES. J. Forest. 63: 248-251, illus.
Time required to kill cambium in situ *with a propane flame was a function of both thickness and thermal properties of the overlying bark; resistance was directly correlated with tree diameter. Of 14 pine and hardwood species longleaf and slash pine were most resistant, and sweetgum, cherry, and holly least resistant.*

HARE, R. C.
1965. SIMPLE HOT STAGE FOR STUDYING CRITICAL CELL TEMPERATURES. Can. J. Bot. 43: 777-778, illus.
Trials with an easily constructed stage indicate that cells of longleaf pine stem tissue may be more heat-tolerant than cells of white pine.

HARE, R. C.
1965. SIMULATING FOREST FIRES FOR RESEARCH. U. S. Forest Serv. Fire Contr. Notes 26(1): 3, illus.
See first entry by Hare, above.

JONES, A. R., JR., TAYLOR, M. L., AND BERTRAND, A. L.
1965. SOME HUMAN FACTORS IN WOODS BURNING. Louisiana Agr. Exp. Sta. Bull. 601, 28 pp., illus.
In the early 1940's, 70 percent of the residents of the Vernon District of the Kisatchie National Forest, in Louisiana, held beliefs unfavorable to the established fire regulations. Today, more than two-thirds are in favor.

▼ MCLESKEY, H. M.
1968. FORESTRY LAW AND ORGANIZATION IN MISSISSIPPI. Soc. Sci. Res. Center, Miss. State Univ. Rep. 23, 32 pp.
A review, with special reference to fire-prevention aspects.

REIFSNYDER, W. E., HERRINGTON, L. P., AND SPALT, K. W.
1967. THERMOPHYSICAL PROPERTIES OF BARK OF SHORTLEAF, LONGLEAF, AND RED PINE. Yale Forest. Bull. 70, 41 pp., illus.
Barks of these three pines have no pecu-

liarities in their thermal properties that would make them unusually effective in protecting the cambium from the heat of a fire. Bark thickness appears to be the primary factor in determining a tree's fire resistance.

Spalt, K. W., and Reifsnyder, W. E.
1962. bark characteristics and fire resistance: a literature survey. U. S. Forest Serv. South. Forest Expt. Sta. Occas. Paper 193, 19 pp., illus.

Little attention has been given to the physical and thermal properties that determine the effectiveness of bark in insulating trees against fire damage. Study of the thermal conductivity and diffusivity, density, and moisture relations of bark would be rewarding.

▼Toole, E. R.
1965. fire damage to commercial hardwoods in southern bottom lands. Fourth Ann. Tall Timbers Fire Ecol. Conf. Proc., pp. 144-151, illus.
Fires must be prevented where hardwood crops are to be grown.

REGENERATION

GENERAL

Bouler, T. P.
1968. a practical homemade nursery soil sifter. USDA Forest Serv. Tree Planters' Notes 19(1): 1-2.
Capacity is about 1 cubic yard of fine potting soil per hour.

Burton, J. D.
1964. twenty years of growth in the norris watershed plantations. Jour. Forestry 62: 392-397, illus.
Shortleaf and eastern white pine survived and grew well. Yellow-poplar in pure stands outgrew the pines on good sites. Of various mixtures, only sweetgum with yellow-poplar appeared satisfactory. Germination and early survival of direct-seeded black walnut and oaks were good, but seedlings were destroyed by rodents before the fifth year. Plantations were on abandoned fields.

Burton, J. D.
1964. twenty-year results of planting experiments in east tennessee. South. Lumberman 209(2609): 112-113, illus.
See entry above.

Czabator, F. J.
1962. germination value: an index combining speed and completeness of pine seed germination. Forest Sci. 8: 386-396, illus.
Completeness is expressed as Mean Daily Germination, or the percentage of full seeds germinating by the end of the test, divided by the number of days to the end of the test. Speed is represented by Peak Value, the highest value obtained from daily computations of (cumulative germination)/(number of days since start of test). *Germination Value then equals MDG × PV.*

Grano, C. X.
1966. an eight-day volumetric pollen sampler. U. S. Forest Serv. Res. Note SO-35, 4 pp., illus.
The pollen sampler described, unlike commonly used stationary adhesive-bearing slides and similar devices, provides accurate, continuous, volumetric estimates of atmospheric pollen load. The sampler is simple to construct.

Russell, T. E., and Mignery, A. L.
1966. wire staples for holding down seedspot screens. J. Forest. 64: 757, illus.
A commercial tool that drives long staples into the soil is efficient for fastening down screens to protect forest seeds and seedlings from predators.

Shoulders, E., Hollis, J. P., Merrifield, R. G., and others.
1965. test of soil fumigants in louisiana. U. S. Forest Serv. Tree Planters' Notes 73, pp. 14-21.
Large-scale fumigation of forest nursery soil is a practical and effective way of controlling root diseases, nematodes, and weeds, but the nurseryman should isolate problem areas and choose a fumigant for his particular needs.

PINE

Barnett, J. P.
1964. stored longleaf seed successfully direct seeded. U. S. Forest Serv. Tree Planters' Notes 65, pp. 3-5.
Seed stored 7 years at 0°F. and 8 or 14 percent moisture, or at 25°F. and 8 percent moisture, yielded tree percents almost as high as those from fresh seed.

Barnett, J. P.
1969. long-term storage of longleaf pine seeds. USDA Forest Serv. Tree Planters' Notes 20 (2): 22-25.
High viability can be maintained for 10 years by drying seed to moisture content of 10 percent and storing at 0° F.

Barnett, J. P.
1969. moisture stress affects germination of longleaf and slash pine seeds. Forest Sci. 15: 275-276.
Osmotic stresses greater than 8 atmospheres reduced germination.

Barnett, J. P.
1970. flotation in ethanol affects storability of spruce pine seeds. USDA Forest Serv. Tree Plant. Notes 21(4): 18-19.
Flotation in 95-percent ethanol to separate full from empty spruce pine seeds

causes viability to decline rapidly in storage. Viability measured soon after treatment is not affected.

BARNETT, J. P.
1970. GERMINATION INHIBITORS UNIMPORTANT IN DORMANCY OF SOUTHERN PINE SEEDS. USDA Forest Serv. Res. Note SO-112, 4 p.
Bioassays of seed extracts and leachates revealed no evidence of a germination inhibitor in seeds of slash, shortleaf, spruce, or Ocala sand pine. Inhibitory activity was found in loblolly pine seeds, but it did not appear to be the major cause of dormancy in these seeds.

BARNETT, J. P.
1970. STORAGE OF SAND PINE SEEDS. USDA Forest Serv. Tree Plant. Notes 21(4): 11-12.
Sand pine seeds can be safely stored for at least 5 years at subfreezing temperatures and a moisture content of 10 percent or less.

BARNETT, J. P., AND MCLEMORE, B. F.
1965. CONE AND SEED CHARACTERISTICS OF SAND PINE. U. S. Forest Serv. Res. Pap. SO-19, 13 pp., illus.
Trees of the Choctawhatchee race, from western Florida, averaged 1,010 cones per bushel and 56,100 seeds per pound. The Ocala race of peninsular Florida averaged 830 cones per bushel and 47,200 seeds per pound. Choctawhatchee cones open readily at 105° F.; Ocala cones open if dipped in boiling water and dried. Seed from both races is easily stored at 10 percent moisture and 25° F. Choctawhatchee seed requires stratification; Ocala seed is nondormant.

BARNETT, J. P., AND MCLEMORE, B. F.
1966. REPELLENT-COATED PINE SEED CAN BE STORED. Forest Farmer 25(9): 14.
The seed can be stored at least 1 year, even after stratification.

BARNETT, J. P., AND MCLEMORE, B. F.
1966. SAND PINE CONES AND SEED. U. S. Forest Serv. Tree Planters' Notes 76, pp. 15-16.
Trees of the Choctawhatchee race, from western Florida, averaged 1,010 cones per bushel and 56,100 seeds per pound. The Ocala race of peninsular Florida averaged 830 cones per bushel and 47,200 seeds per pound. Choctawhatchee cones open readily at 105° F.; Ocala cones will open if dipped in boiling water and then dried. Ocala cones 2 or more years old yield seed of decreased viability, but seed from both races is easily stored at 10 percent moisture and 25° F. Choctawhatchee seed requires stratification for 14 days, but Ocala seed from new and 1-year cones is nondormant.

▼ BARNETT, J. P., AND MCLEMORE, B. F.
1967. GERMINATION OF LOBLOLLY PINE SEED HASTENED BY SOAKINGS IN AERATED COLD WATER. U. S. Forest Serv. Tree Planters' Notes 18(2): 24-25.
Soaking for 28 days stimulated germination nearly as well as did conventional cold stratification.

BARNETT, J. P., and MCLEMORE, B. F.
1967. IMPROVING STORAGE OF SPRUCE PINE SEED. U. S. Forest Serv. Tree Planters' Notes 18(2): 16.
It appears that spruce pine seed should be stored at 0° F. and at moisture content not above 9 percent.

BARNETT, J. P., AND MCLEMORE, B. F.
1967. STUDY OF SPRUCE PINE CONE MATURITY AND SEED YIELD. U. S. Forest Serv. Tree Planters' Notes 18(2): 18.
Cones can be collected when their specific gravity drops to 0.89. A bushel contains about 1,900 cones, which will yield from 0.1 to 1 pound of cleaned seed. Seeds average 46,000 to the pound.

BARNETT, J. P., AND MCLEMORE, B. F.
1970. STORING SOUTHERN PINE SEEDS. J. Forest. 68: 24-27.
Viability of seeds of all southern pine species can be maintained long enough for practical needs. Control of moisture content and temperature is of primary importance, but cone maturity, time from harvest to extraction, and techniques of extracting and processing are also influential.

▼ BIESTERFELDT, R. C.
1969. ACQUITTAL OF THE SHORT-TAILED SHREW. Forests and People 19(2): 18-19.
Shrews were suspected of clipping newly germinated seedlings on areas direct-seeded to southern pine, but caged animals ate no green tissue and very few seeds.

▼ BIESTERFELDT, R. C., AND MANN, W. F., JR.
1969. NEW HOPE FOR STRIP-MINE RECLAMATION. Forest Farmer 28(12): 6-8, 16, 18.
Direct-seeding of pines has been successful on strip-mined land in northern Alabama.

BILAN, M. V.
1962. EFFECT OF PLANTING DATE ON REGENERATION AND DEVELOPMENT OF ROOTS OF LOBLOLLY PINE SEEDLINGS. Thirteenth Cong. Int. Union Forest Res. Organ. Proc., part 2, sect. 22, No. 15, 5 pp., illus.
In east Texas, time required for lateral roots to begin growing decreased from 10 weeks for seedlings planted in November to 4 weeks for those planted in March.

Boyer, W. D.
1963. Development of longleaf pine seedlings under parent trees. U. S. Forest Serv. Res. Paper SO-4, 5 pp., illus. South. Forest Expt. Sta., New Orleans, La.
In southwest Alabama, unburned seedlings under overstories ranging up to 90 square feet of basal area per acre survived as well as those with no tree competition. After 7 years, milacre stocking averaged 99 percent and survival 72 percent. Growth, but not survival, improved with distance from parent trees. Seedlings under tree crowns had less brown spot than those in the open.

Boyer, W. D.
1963. Longleaf pine seed dispersal. U. S. Forest Serv. Res. Note SO-3, 2 pp., illus. South. Forest Expt. Sta., New Orleans, La.
Number of sound seeds dispersed from forest

walls into openings was halved with each 55-link increase in distance from the seed source. Seventy-one percent fell within 1 chain of the base of the parent trees.

Boyer, W. D.
1964. LOGGING DAMAGE TO LONGLEAF SEEDLINGS. Jour. Forestry 62: 338-339.
Well-stocked seedling stands can survive removal of medium overstories, particularly if log landings are located so as to minimize damage.

Boyer, W. D.
1964. LONGLEAF PINE SEED PREDATORS IN SOUTHWEST ALABAMA. Jour. Forestry 62: 481-484, illus.
Predators caused 93-99 percent of all longleaf pine seed and seedling losses during the first 3 months after seeding. Mice caused 58 percent of the losses, birds and large mammals 33 percent, ants 9 percent.

Boyer, W. D.
1964. LONGLEAF SEED LOSSES TO ANIMALS ON BURNED SEEDBEDS. U. S. Forest Serv. Res. Note SO-6, 3 pp., illus.
Losses in well-stocked, second-growth stands were about the same on fresh fall burns as on old roughs, worse on winter burns than on old roughs.

Boyer, W. D.
1965. NATURAL REGENERATION OF LONGLEAF PINE: A NEW LOOK AT AN OLD PROBLEM. Ala. Forest Prod. 8(10): 53-56. *Also as* NEW LIFE FOR AN OLD FAVORITE. South. Lumberman 209(2609): 99-101. 1964.
Recent research suggests that longleaf pine on many sites can be regenerated from seedling stands established under relatively full parent overstories.

Burns, R. M.
1966. MACHINE SEEDING—ROW AND BROADCAST. Proc., Direct Seeding Workshops, Alexandria, La., and Tallahassee, Fla., pp. 18-20. U. S. Forest Serv., Atlanta, Ga.
Machines have been developed and sowing rates determined for afforesting a variety of sites in the South.

▼Burns, R. M., and McReynolds, R. D.
1966. CLUSTERED SAND PINE CONES. J. Forest. 64: 812-813, illus.
Two large clusters of mature Choctawhatchee sand pine cones were found in a young sandhills plantation.

▼Burton, J. D.
1965. GREENING UP THE BARREN GROUNDS. KTG J. 5(1): 6-7, illus.
Planting loblolly, shortleaf, or Virginia pine on stripped coal lands in southeastern Tennessee produced earlier and more satisfactory cover and erosion control than direct-seeding the same species or planting Norway spruce or pitch, eastern white, Austrian, or Scotch pines.

▼Campbell, T. E.
1964. DEVELOPMENT OF SLASH PINE ON SEEDED SPOTS. Jour. Forestry 62: 821-822, illus.
On a flatwoods site in southwest Louisiana, third-year heights of spot-seeded trees showed no adverse effects of clustering. Assertion of dominance had begun.

Campbell, T. E.
1967. LOBLOLLY-SHORTLEAF PINE SEEDFALL IN LOUISIANA. J. Forest. 65: 894-895, illus.
Over a 5-year period, seed production varied widely within and between two nearby stands, but 7 out of a total of 10 seed crops were good ones.

Campbell, T. E.
1970. BLARINA BREVICAUDA AND CRYPTOTIS PARVA DO NOT DAMAGE LONGLEAF PINE COTYLEDONS. Amer. Midland Natur. 84: 256-257.
Twenty-eight caged shrews of two species did not destroy longleaf pine seedlings in the distinctive manner of an unidentified predator of direct-seeded stands.

Campbell, T. E.
1970. PINE DIRECT SEEDING NOT IMPERILED BY FLORIDA HARVESTER ANTS. USDA Forest Serv. Res. Note SO-108, 3 p.
Florida harvester ants foraged mostly empty seeds and spent seedcoats from germinated seedlings on areas sown to slash pine in Mississippi. Pine stocking was not improved significantly by eradicating ants before sowing.

Campbell, T. E.
1970. SPRING SOWING OF LONGLEAF PINE REDUCES RISK OF SEEDLING CLIPPING. J. Forest. 68: 658-659.
Longleaf pine can be established by direct-seeding burned, disked, or furrowed sites in February to circumvent midwinter seedling losses. Although the ability of spring-sown seedlings to survive severely dry summers has not been demonstrated, sowing season had no effect on first-year survival during a 3-year period of moderate summer conditions.

Cassady, J. T.
1962. PINE SEED SOWING METHODS. Forest Farmer 21(6): 7-8, 13-14, illus.
Reviews development of machines and techniques for spot, broadcast, and row seeding.

Croker, T. C., Jr.
1964. FRUITFULNESS OF LONGLEAF TREES MORE IMPORTANT THAN CULTURE IN CONE YIELD. Jour. Forestry 62: 822-823.
Five-year cone production of 60-year-

old longleaf pines in south Alabama was influenced more by inherent fruitfulness of individual trees than by fertilization and irrigation.

CROKER, T. C., JR.
1964. TWO H-C FURROW SEEDERS. U. S. Forest Serv. Res. Note SO-5, 4 pp., illus.
General description and operating instructions.

CROKER, T. C., JR.
1967. HOW ABOUT A FURROW SEEDER? Forest Farmer 26(11): 6-7, illus. *Also as* FURROW SEEDERS CAN SAVE MUCH MONEY. U. S. Forest Serv. Tree Planters' Notes 18(1): 1-4, illus. *Also as* THE CASE OF THE FURROW SEEDER. Ala. Forest Prod. 10(7): 51-53, illus.
All furrow seeders contain a scalper, bedder, sower, and packer. The success of a particular model depends on how well the designer adapts these components to local site conditions.

CROKER, T. C., JR.
1968. LONGLEAF PINE REGENERATION IN MOUNTAIN AND PIEDMONT PROVINCES OF ALABAMA. USDA Forest Serv. Res. Note SO-76, 3 pp.
Excellent stands can be established naturally under a shelterwood overstory during a good seed year. Seedbed burning increases establishment and can be done without damaging the soil on steep slopes. Direct seeding is likely to fail if squirrel populations are high.

CROKER, T. C., JR.
1969. NATURAL REGENERATION SYSTEMS FOR LONGLEAF PINE. Forest Farmer 28(13): 6-7, 16-18.
Shelterwood systems have shown great promise in research at Brewton, Alabama.

DERR, H. J.
1963. AN IMPROVED REPELLENT FOR DIRECT-SEEDING. Forest Farmer 23(2): 12-13. *Also as* ARASAN 42-S, AN IMPROVED REPELLENT FOR DIRECT-SEEDING. Forests and People 13(3): 18-19, 42. *Also as* BETTER REPELLENT FOR DIRECT SEEDING. USDA Forest Serv. Tree Plant. Notes 61, p. 26-30.
Arasan 42-S, an aqueous suspension of thiram, is recommended as a bird-repellent seed coating in direct-seeding the southern pines. It is dustless, more durable than wettable powder, and easy to apply.

Derr, H. J.
1963. Needle clipping retards growth of planted longleaf pine. U. S. Forest Serv. Tree Planters' Notes 57, pp. 31-33, illus.
Seedlings grown at nursery bed densities of 10, 20, and 30 per square foot were clipped to needle lengths of 5 inches and planted on an average site.

▼ DERR, H. J.
1964. NEW REPELLENT FORMULATION FOR DIRECT SEEDING. Jour. Forestry 62: 265, illus.
Arasan 42-S, an aqueous suspension of thiram, is recommended as a bird-repellent seed coating in direct-seeding the southern pines. It is dustless, more durable than wettable powder, and easy to apply.

▼ DERR, H. J.
1966. WHAT, WHEN, WHERE, AND HOW OF AERIAL SEEDING. Proc., Direct Seeding Workshops, Alexandria, La., and Tallahassee, Fla., pp. 8-10. U. S. Forest Serv., Atlanta, Ga.
Fifteen years of experience have provided techniques and equipment for seeding the southern pines fast and accurately with aircraft.

DERR, H. J., AND MANN, W. F., JR.
1970. SITE PREPARATION IMPROVES GROWTH OF PLANTED PINES. USDA Forest Serv. Res. Note SO-106, 3 p.
At age 5 years slash pines planted on furrowed, flat-disked, and mound-disked plots were significantly taller and larger in diameter than those planted on unprepared plots on a Beauregard silt loam. The same site treatments improved diameter growth of loblolly pine, but differences in height were nonsignificant.

▼ DUFFY, P. D.
1970. FERTILIZERS FOR BULLET-PLANTED LOBLOLLY PINES. Miss. Farm Res. 33(7): 1, 5.
When outplanted in the soil-filled plastic tubes in which they have been germinated and grown, seedlings often make slow progress for the first few months. A study in north-central Mississippi indicates that growth will be speeded if soil in the tubes is fertilized before planting.

▼ FERGUSON, E. R.
1962. FURROW-SEEDING AND MACHINE PLANTING LOBLOLLY PINE IN EAST TEXAS. Tex. Forest News 41(1): 5, illus.
On suitable sites, furrow seeding promises satisfactory stands at about half the cost of machine planting.

Ferguson, E. R.
1963. Overstory density key to pine seedling survival and growth in east Texas. Jour. Forestry 61: 597-598, illus.
Both survival and growth of underplanted loblolly pine were retarded in direct proportion to the density of the overstory, which was of shortleaf and loblolly pine.

Ferguson, E. R., and STRANSKY, J. J.
1962. SITE PREPARATION BENEFITS PINE SEEDING AND PLANTING IN TEXAS. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 138. *Also as* SITE PREPARATION PAYS. Forest World 1(2): 13.
Furrowing and disking improved first-year survival of loblolly and shortleaf pines planted and sown in both fields and woods.

▼ GRANO, C. X.
1965. MORTALITY OF PLANTED LOBLOLLY PINE FROM HARDWOOD OVERTOPPING. J. Forest. 63: 938-939, illus.
Mortality was related to degree of overtopping.

GRANO, C. X.
1970. SEED YIELDS IN LOBLOLLY-SHORTLEAF PINE SELECTION STANDS. USDA Forest Serv. Res. Note SO-109, 4 p.

In mature selection stands containing 12 to 92 square feet of basal area per acre in trees of seed-bearing size, seed yield per acre increased with seed-tree density up to 60 to 69 square feet. At higher densities seed production declined. Production per square foot of seed-tree basal area increased curvilinearly with decreasing stand basal area.

▼HATCHELL, G. E.
1964. IMMEDIATE RELEASE NEEDED FOR MAXIMUM GROWTH OF SEEDED LOBLOLLY PINE. U. S. Forest Serv. Tree Planters' Notes 66, pp. 19-22, illus.
Delaying release for 1 or 2 years substantially reduces height growth, regardless of site or cover conditions, and may deplete stocking.

HATCHELL, G. E.
1964. SMALL-MAMMAL SPECIES AND POPULATIONS IN THE LOBLOLLY-SHORTLEAF PINE FOREST TYPE OF LOUISIANA. U. S. Forest Serv. Res. Paper SO-10, 12 pp., illus.
The shorttail shrew, golden mouse, cotton mouse, and fulvous harvest mouse were the most abundant. Mouse populations varied directly with density of understory vegetation; burning in February changed species composition but not total mouse population.

HODGES, J. D., and SCHEER, R. L.
1962. SOIL COVER AIDS GERMINATION OF PINE SEED ON SANDY SITES. U. S. Forest Serv. Tree Planters' Notes 54, pp. 1-3.
Sowing depths up to three-fourths of an inch are best for slash and sand pine. Longleaf pine should not be sown deeper than one-half inch.

▼ JORGENSEN, J. R.
1965. IRRIGATION OF SLASH PINE WITH PAPER MILL EFFLUENTS. Louisiana State Univ. Div. Eng. Res. Bull. 80, pp. 92-100, illus.
In two experiments with slash pine seedlings, growth and survival were inversely related to application rate and salt content of effluents used as irrigants. Effluents low in sodium and other soluble salts and organic residues were neither beneficial nor detrimental.

JORGENSEN, J. R.
1968. ROOT GROWTH OF DIRECT-SEEDED SOUTHERN PINE SEEDLINGS. USDA Forest Serv. Res. Note SO-79, 7 pp.
Root development of direct-seeded loblolly, longleaf, and slash pines was influenced by soil texture and structure during the first summer of growth. Plants in the field had root systems much different than reported for seedlings in greenhouses or nurseries.

JORGENSEN, J. R.
1968. THIRAM IMPROVES FIELD GERMINATION OF COVERED LONGLEAF SEED. USDA Forest Serv. Tree Planters' Notes 19(3): 13-14.
Thiram, a fungicide applied to pine seed as a bird repellent, depressed germination in the laboratory but benefited seed sown under soil in simulated field conditions.

JORGENSEN, J. R., AND SHOULDERS, EUGENE.
1967. MYCORRHIZAL ROOT DEVELOPMENT VITAL TO SURVIVAL OF SLASH PINE NURSERY STOCK. U. S. Forest Serv. Tree Planters' Notes 18(2): 7-11, illus.
Mycorrhizal condition, as well as grade, consistently affected first-year field survival. Nursery origin also influenced survival, but nursery superiority varied from year to year.

▼KOSHI, P. T., and STEPHENSON, G. K.
1962. SHADE AND MULCH AS INFLUENCES ON LOBLOLLY SEEDLINGS AND THEIR IMMEDIATE ENVIRONMENT. Forest Sci. 8: 191-204, illus.
During a normal and a very dry season in east Texas, shading reduced temperatures and evaporation potential but did not affect soil moisture levels or rate of loss. Mulch did not reduce net depletion, but raised moisture levels by increasing percolation. If it reduced evaporation, this was obscured by transpiration from the seedlings. Soil moisture loss increased with moisture levels and with seedling size. No seedlings were damaged by heat. As transpiration appeared to be the chief agent of depletion, any vegetation left to shade seedlings would be detrimental rather than beneficial.

LOHREY, R. E.
1970. SPOT SEEDING SLASH AND LOBLOLLY PINES. Forest Farmer 29(12): 12, 18.
Slash and loblolly pines sown at the rate of six seeds per spot can be expected to grow well, express dominance early, and form acceptable stands without precommercial thinning.

MCCLURKIN, D. C.
1962. GOOD SURVIVAL OF NONDORMANT LOBLOLLY PINE SEEDLINGS. U. S. Forest Serv. Tree Planters' Notes 51, p. 10, illus.
In north Mississippi, mortality among nondormant seedlings, even when frost-nipped, averaged only 1 percent more than among seedlings planted while dormant.

MCCLURKIN, D. C.
1966. SURVIVAL OF PLANTED LOBLOLLY PINE SEEDLINGS: MOISTURE, TEMPERATURE, AND SOIL AS INFLUENCES. J. Forest. 64: 731-734, illus.
In a 2-year study in north Mississippi, first-year survival was related to time and duration of drought. Especially on sandy soils, heavy mortality occurred when drought lasted 3 weeks in May. Seedlings frozen in the packing bale were poor planting risks. Once planted, trees withstood extreme and sudden temperature changes.

▼MCLEMORE, B. F.
1962. PREDICTING SEED YIELDS OF SOUTHERN PINE CONES. Jour. Forestry 60: 639-641, illus.
Formulae have been developed for estimating yields of longleaf, slash, and loblolly pine cones from the number of full seeds cut through when cones are sliced longitudinally with a sharp knife.

MCLEMORE, B. F.
1964. LIGHT DURING STRATIFICATION HASTENS DARK-GERMINATION OF LOBLOLLY PINE SEED. Forest Sci. 10: 348-349, illus.
The amount of light that Pinus taeda

L. seeds require for germination is reduced by cold moist stratification aimed at breaking seed dormancy. Irradiation with white light during stratification further fulfills the light requirement.

McLemore, B. F.
1965. PENTANE FLOTATION FOR SEPARATING FULL AND EMPTY LONGLEAF PINE SEEDS. Forest Sci. 11: 242-243, illus.
Full and empty seeds can be separated with high precision by flotation in n-pentane.

McLemore, B. F.
1966. TEMPERATURE EFFECTS ON DORMANCY AND GERMINATION OF LOBLOLLY PINE SEED. Forest Sci. 12: 284-289, illus.
For after-ripening Pinus taeda *seed, 10° C. was superior to 5° or 15°, but 5° is recommended to decrease the danger of heating. At 10°, a period of 112 days was required when tests were conducted in darkness. Excellent germination of after-ripened seed was obtained at 17.5° to 27.5°, but there was a tendency toward poor radicle development at the higher temperature.*

McLemore, B. F.
1969. LONG STRATIFICATION HASTENS GERMINATION OF LOBLOLLY PINE SEED AT LOW TEMPERATURES. J. Forest. 67: 419-420.
Longer periods of stratification were required to obtain prompt and complete germination of loblolly pine seed under simulated field conditions than under optimum laboratory conditions.

McLemore, B. F., and Barnett, J. P.
1966. LOBLOLLY SEED DORMANCY INFLUENCED BY CONE AND SEED HANDLING PROCEDURES AND PARENT TREE. U. S. Forest Serv. Res. Note SO-41, 4 pp.
Stratified, kiln-extracted seeds from late collections germinated best. Dormancy of seeds varied between trees but for individual trees it was relatively constant from year to year.

McLemore, B. F., and Barnett, J. P.
1966. STORING REPELLENT-COATED SOUTHERN PINE SEED. J. Forest. 64: 619-621.
If held at 25° F. the seed can be stored at least 1 year, even after stratification.

McLemore, B. F., and Barnett, J. P.
1967. EFFECTIVE STRATIFICATION OF SPRUCE PINE SEED. U. S. Forest Serv. Tree Planters' Notes 18(2): 17-18.
Up to 28 days, both total germination and speed of germination increased as the stratification period lengthened; extending the period to 56 days improved speed only.

McLemore, B. F., and Barnett, J. P.
1968. MOISTURE CONTENT INFLUENCES DORMANCY OF STORED LOBLOLLY PINE SEED. Forest Sci. 14: 219-221.
Dormancy is greatest when seed is stored at 10 to 18 percent moisture. Seed is least dormant above this range but deteriorates more rapidly. Storage below 10 percent moisture is recommended to preserve viability and prevent deep dormancy.

McLemore, B. F., and Hansbrough, T.
1970. INFLUENCE OF LIGHT ON GERMINATION OF PINUS PALUSTRIS SEEDS. Physiol. Plant. 23: 1-10.
Red light promotes germination of longleaf pine seed, and far-red light inhibits. The promotion-inhibition process is repeatedly reversible. Response varied greatly among single-tree lots and depended on length of time the seeds were imbibed at 5° C. Stratification for 28 days essentially removed light requirements for germination.

Mann, W. F., Jr.
1962. HOW TO DIRECT-SEED THE SOUTHERN PINES. Forest Farmer (Tenth Manual ed.) 21(7): 52-55, illus. *Also in* Forest World 1(2): 24-30, 32.
General review, applicable to most southern pine species and sites.

▼ Mann, W. F., Jr.
1962. TOOLS FOR DIRECT SEEDING. Forest Farmer 21(5): 13-16, illus.
Brief description of machines and methods.

Mann, W. F., Jr.
1965. PROGRESS IN DIRECT-SEEDING THE SOUTHERN PINES. *In* Direct Seeding in the Northeast—A Symposium, pp. 9-13, illus. Exp. Sta. Bull., Univ. Mass.
Reviews development and application of methods for southern pines, and suggests ways of applying them in Northeast.

Mann, W. F., Jr.
1966. DIRECT-SEEDING SLASH PINE. Southern Lumberman 213(2656): 147-150, illus.
Summarizes main steps in seeding.

▼ Mann, W. F., Jr.
1966. DIRECT SEEDING THE SOUTHERN PINES: DEVELOPMENT AND APPLICATION. Proc., Direct Seeding Workshops, Alexandria, La., and Tallahassee, Fla., pp. 2-3. U. S. Forest Serv., Atlanta, Ga.
Since 1955, almost 1 million acres have been direct-seeded in the South. The current rate is 175,000 acres annually.

Mann, W. F., Jr.
1966. GUIDES FOR DIRECT-SEEDING THE SOUTHERN PINES. Forest Farmer 25(7): 99-103, illus.
Sketches techniques for seeding seven major species on both large and small tracts.

Mann, W. F., Jr.
1968. TEN YEARS' EXPERIENCE WITH DIRECT-SEEDING IN THE SOUTH. J. Forest. 66: 828-833.
Since the technique was developed in 1957, large-scale operations have shown it to be fast, reliable, economical, and well adapted for diverse sites in the southern pine region.

Mann, W. F., Jr.
1969. A REVIEW—TECHNIQUES AND PROGRESS IN REGENERATING SOUTHERN PINES. Forest Prod. J. 19 (8): 10-16.
The past few decades can be considered

an era of regeneration in the southern pine region.

MANN, W. F., JR.
1969. AT LAST—LONGLEAF PINE CAN BE PLANTED SUCCESSFULLY. Forest Farmer 28(6): 6-7, 18-19.
Over the last 15 years, research-derived improvements in technique have made it possible to plant longleaf as reliably as other species.

MANN, W. F., JR.
1970. DIRECT-SEEDING LONGLEAF PINE. USDA Forest Serv. Res. Pap. SO-57, 26 p.
Describes in detail each step from initial planning to final appraisal of results.

MANN, W. F., JR.
1970. THE PLANTING JOB: ANOTHER LOOK AT THE SOUTH'S PINE REGENERATION PROBLEM. Forest Farmer 30(2): 8-9, 39-42.
If southern forests are to make their full contribution to the economy, 70 million acres must be regenerated to pine by the year 2000. Forest industries have made a start on their share of the work but need help from research. Owners of small tracts require financial incentives, technical guidance, and methods and equipment designed especially for their needs.

MANN, W. F., JR., AND BURNS, E. B.
1965. DIRECT SEEDING FOR THE SMALL LANDOWNER. Forest Farmer 25(3): 6-7, 14, illus.
Both spot and broadcast seeding were successful on tracts typical of rundown farm woodlands.

▼ MANN, W. F., JR., AND BURNS, E. B.
1966. SMALL LANDOWNERS CAN DIRECT-SEED TOO. Forests and People 16(1): 21, 36, 40, illus.
Both spot and broadcast seeding were successful on tracts typical of rundown farm woodlands.

MANN, W. F., JR., AND DERR, H. J.
1964. GUIDES FOR DIRECT-SEEDING SLASH PINE. U. S. Forest Serv. Res. Paper SO-12, 27 pp., illus.
Slash pine can be sown economically on a wide variety of sites throughout the South. This paper covers all phases of sowing, from planning to appraisal of results.

▼ MANN, W. F., JR., AND DERR, H. J.
1965. HOW TO DIRECT-SEED SLASH PINE. Forest Farmer 24(11): 6-7, 17-19, illus.
Summary of recommendations.

MANN, W. F., JR., AND DERR, H. J.
1970. RESPONSE OF PLANTED LOBLOLLY AND SLASH PINE TO DISKING ON A POORLY DRAINED SITE. USDA Forest Serv. Res. Note SO-110, 3 p.
After 8 years on a Caddo-Beauregard silt loam, loblolly pines on flat-disked and bedded plots were 2.2 to 2.7 feet taller than those on unprepared check plots. Slash pines appeared to do best on bedded plots. In both species the responses to site treatment were consistent over the span of the study.

MANN, W. F., JR., AND TAYLOR, H. T., JR.
1969. AERIAL ROW SEEDING POSSIBLE. J. Forest. 67: 814-815.
Southern pine seed can be sown from the air in reasonably well defined rows.

▼ MAPLE, W. R.
1962. SEEDING SHORTLEAF PINE IN THE OZARKS. Univ. Mo. Forestry Short Course Proc., pp. 50-54.
Mountain soils and sites require some modification of techniques that are successful in the Coastal Plain.

MAPLE, W. R.
1965. SHORTLEAF PINE STANDS FIVE YEARS AFTER SEEDFALL ON PREPARED SITES. U. S. Forest Serv. Res. Note SO-27, 2 pp.
North Arkansas sites prepared with a rotary brushcutter had more seedlings than sites prepared by prescribed burning or by chemical treatment of hardwoods.

MAPLE, W. R.
1966. APPALACHIAN LOBLOLLY GROWS WELL IN ARKANSAS OZARKS. U. S. Forest Serv. Res. Note SO-33, 2 pp.
The trees survived well and reached pulpwood size in 15 years.

MAPLE, W. R.
1969. SHADED LONGLEAF SEEDLINGS CAN SURVIVE PRESCRIBED BURNS. Forest Farmer 29(3): 13.
After a cool fire in January, seedling mortality averaged 4.3 percent and was unrelated to density of the longleaf pine overstory, which ranged from 10 to 60 square feet per acre.

MAPLE, W. R.
1970. PRESCRIBED WINTER FIRE THINS DENSE LONGLEAF SEEDLING STAND. USDA Forest Serv. Res. Note SO-104, 2 p.
A prescribed winter fire in central Alabama thinned a longleaf pine stand from 177,000 seedlings per acre to 6,300. Seedlings with exposed rootcollars were about twice as susceptible to the fire as seedlings whose rootcollars were at or near the soil surface.

▼ MOEHRING, D. M.
1964. SPEEDING UP GROWTH OF THE LOBLOLLY. Forest Farmer 23(6): 9, 13-14, illus.
In southern Arkansas, a watered and fertilized plantation produced 20 cords of wood per acre in 8 years.

▼ RICHARDSON, B. Y.
1965. NEW TOOLS FOR DIRECT SEEDING. Southern Lumberman 211(2632): 150-151, illus.
Describes a seeder that operates economically on small tracts, and a pneumatic device for metering seed precisely.

▼ RICHARDSON, B. Y., CUTCHINS, M. A., AND ROBINSON, W. J.
1968. FEASIBILITY OF AERIAL ROW SEEDING. Proc., Forest Eng. Conf. ASAE Pub. PROC-368, pp. 61-64.
Aerial row seeding is theoretically feasible but a device must be developed to eject seeds at controlled rates.

▼ ROYALL, W. C., JR., and FERGUSON, E. R.
1962. CONTROLLING BIRD AND MAMMAL DAMAGE IN DIRECT

SEEDING LOBLOLLY PINE IN EAST TEXAS. Jour. Forestry 60: 37-39.

Blended with higher rates of bird repellent, endrin does not appear to present a serious hazard to bird populations.

Russell, T. E.

1963. Planted shortleaf responds to prompt release. U. S. Forest Serv. Tree Planters' Notes 61, pp. 13-16, illus.

On the Cumberland Plateau, delay in releasing planted pines from competing hardwoods sacrificed about 1 year's growth for each year seedlings were suppressed.

RUSSELL, T. E.

1964. DIRECT-SEEDING PINES ON TENNESSEE'S HIGHLAND RIM. KTG Jour. 4(1) : 4-5, illus.

Requisites for success are: break up hardwood litter, use a repellent, seed in winter or early spring, stratify seed for late sowing, deaden competing vegetation.

RUSSELL, T. E.

1964. FROM OAK-HICKORY TIE ORCHARDS TO PROFITABLE WHITE PINE—BY DIRECT SEEDING. U. S. Forest Serv. Tree Planters' Notes 67, pp. 19-21, illus.

On the Cumberland Plateau of Tennessee, both repellent-coated and untreated seed produced acceptable stands when broadcast on disked sites, but repellents doubled tree percent and improved distribution.

RUSSELL, T. E.

1969. UNDERPLANTING SHORTLEAF PINE. Forest Farmer 29(1): 10, 17-18.

Underplanting was successful on the Cumberland Plateau of Tennessee. Growth was best where low-grade hardwoods were deadened immediately after pines were planted and a silvicide was applied to reduce sprouting.

RUSSELL, T. E.

1970. DIRECT SEEDING LOBLOLLY AND VIRGINIA PINE ON STEEP SLOPES IN CENTRAL TENN. KTG J. 10(2): 8-9.

Both broadcast and spot seeding have given satisfactory stands of loblolly and Virginia pine on the steep slopes of Tennessee's western Highland Rim.

▼ RUSSELL, T. E., AND JONES, C. A.

1968. DIRECT SEEDING IN TENNESSEE'S HIGHLANDS. Forest Farmer 27(11): 16-17, 22.

For success in seeding pine, unwanted hardwoods must be controlled, seedbeds must be prepared adequately, and seed must be sown at the right time and protected from birds and rodents.

RUSSELL, T. E., AND MIGNERY, A. L.

1968. DIRECT-SEEDING PINE IN TENNESSEE'S HIGHLANDS. USDA Forest Serv. Res. Pap. SO-31, 22 pp.

A series of studies show that pine direct-seeding is feasible in Tennessee. Mineral soil seedbeds must be kept free of hardwood leaves, and competing vegetation must be controlled.

▼ SCHEER, R. L.

1968. PINES—DIRECT-SEED OR PLANT? Proc., Symp. on Planted Southern Pines, pp. 113-120. USDA Southeast. Area, State and Priv. Forest., Atlanta, Ga.

The outstanding advantages of seeding are speed of operation, low initial cost and labor requirements, and applicability in unplantable areas. The chief advantages of planting are close control of stocking, uniformity of resulting stands, and conservation of seed.

▼ Shadowen, H. E.

1963. A live-trap study of small mammals in Louisiana. Jour. Mammal. 44: 103-108.

Peromyscus nuttallii was the species caught most frequently between January and June on two tracts of cutover loblolly-shortleaf pine forest, with P. gossypinus next. A winter fire on one tract reversed this order but did not reduce total populations.

SHOULDERS, EUGENE.

1962. DEEP-PLANTED SEEDLINGS SURVIVE AND GROW WELL. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 140.

Tests in Louisiana suggest that it is unnecessary to set loblolly and slash pines precisely to the depth at which they grew in the nursery. To reduce the chance of shallow planting, it may be advisable to instruct crews to set trees slightly deeper than the rootcollar.

Shoulders, Eugene.

1963. Root-pruning southern pines in the nursery. U. S. Forest Serv. Res. Paper SO-5, 6 pp., illus. South. Forest Expt. Sta., New Orleans, La.

In Louisiana, root pruning in the nursery bed usually improves field survival of longleaf pine and sometimes of loblolly and slash pine. Growth of large seedlings is retarded by pruning in August and September, but yields of plantable stock may not be greatly increased thereby, because reductions in oversize seedlings may be offset by increases in undersize stock.

SHOULDERS, EUGENE.

1965. ROOT PRUNING IN SOUTHERN PINE NURSERIES. U. S. Forest Serv. Tree Planters' Notes 70, pp. 12-15, illus.

In Louisiana, root pruning in the nursery bed usually improves field survival of longleaf pine and sometimes of loblolly and slash pine. Growth of large seedlings is retarded by pruning in August and September, but yields of plantable stock may not be greatly increased thereby, because reduction in oversize seedlings may be offset by increases in undersize stock.

SHOULDERS, EUGENE.

1967. LONGLEAF FIELD PERFORMANCE UNIMPAIRED BY NURSERY CLIPPING TO FACILITATE BROWN-SPOT CONTROL. U. S. Forest Serv. Res. Note SO-60, 3 pp., illus.

Neither field survival and growth nor size and grade of nursery stock were adversely affected when the needles of spring-sown seedlings were clipped to a length of 6 inches in late summer or immediately before lifting.

Shoulders, Eugene.
1968. fertilization increases longleaf and slash pine flower and cone crops in Louisiana. J. Forest. 66: 193-197.
Annual fertilization of seed production areas appears practical if mortality of female strobili can be minimized.

Shoulders, E., and Jorgensen, J. R.
1969. mycorrhizae increase field survival of planted loblolly pine. USDA Forest Serv. Tree Planters' Notes 20(1): 14-17.
Mycorrhizae increased survival sufficiently to indicate the desirability of securing mycorrhizal infection of all loblolly seedlings in nursery beds.

Shoulders, E., and Wilson, R. H.
1962. why treat a good site? South. Lumberman 205 (2561): 143-144, illus.
In central Louisiana, site preparation by disking or furrowing improved survival and growth of loblolly, slash, and longleaf pines planted on a good site.

Smith, L. F.
1964. site preparation and cultivation improve survival and growth of planted slash pine. U. S. Forest Serv. Tree Planters' Notes 64, pp. 12-15, illus.
Planting trees in bottoms of fireplow furrows increased survival more than enough to offset the expense of plowing. This and other methods of site preparation, when followed by cultivation, stimulated height growth also, but perhaps not sufficiently to justify costs.

Smith, L. F., and Schmidtling, R. C.
1970. cultivation and fertilization speed early growth of planted southern pines. USDA Forest Serv. Tree Plant. Notes 21(1): 1-3.
Cultivation alone increased heights at age 5 years by about 2 feet in slash and loblolly pines and by more than 1 foot in longleaf. NPK fertilizer substantially increased height growth of all species.

Smith, L. F., and Smith, H. D.
1963. Growth of slash, loblolly, and longleaf pines on cultivated sites. U. S. Forest Serv. Tree Planters' Notes 59, pp. 1-2, illus.
Cultivation and brown-spot control shortened the grass stage of the longleaf trees; by age 4 years their heights averaged 7.3 feet, about the same as third-year heights of slash and loblolly.

Stephenson, G. K.
1963. Ten years of shortleaf pine seed crops in Texas. Jour. Forestry 61: 270-272, illus.
While partial cutting did not induce crops in years of widespread seed failure, it increased the efficiency of individual trees in seed years.

Stephenson, G. K., Goodrum, P. D., and Packard, R. L.
1963. Small rodents as consumers of pine seed in east Texas uplands. Jour. Forestry 61: 523-526, illus.
During 5 years, rodent populations, mostly mice, tended to be low in summer and high in winter and spring. Tests with caged mice indicated that winter populations, which averaged 2-4 per acre, could eat about as much seed as is normally direct-seeded, but would have little effect on natural regeneration when pine mast is abundant.

▼Stransky, J. J.
1962. furrows aid pine survival during drought. U. S. Forest Serv. Tree Planters' Notes 53, pp. 23-24, illus.
During a dry spring and summer in east Texas, loblolly seedlings that had been planted in furrows survived and grew better than those in sod. Mulching with sawdust was not helpful.

Stransky, J. J.
1963. Needle moisture as mortality index for southern pine seedlings. Bot. Gaz. 124: 178-179, illus.
Needle moisture contents of 105 to 65 percent represented the range within which potted shortleaf and loblolly pine seedlings might either live or die. For both species and for two soil types, 85 percent was the midpoint at which seedlings had a 50-50 chance of survival.

Stransky, J. J.
1964. site-preparation effects on early growth of loblolly pine. U. S. Forest Serv. Tree Planters' Notes 64, pp. 4-6, illus.
In east Texas, chemical or mechanical treatments to reduce competition from weeds and grass improved initial survival of planted pines and increased height and diameter growth to a degree still visible after 5 years.

Stransky, J. J., and Wilson, D. R.
1966. pine seedling survival under simulated drought. U. S. Forest Serv. Res. Note SO-30, 2 pp., illus.
Soil moisture was depleted less rapidly from scalped plots than from those in sod, and planted pines survived better on the scalped sites. Shortleaf survived the drought best, then loblolly and slash pine.

Thames, J. L.
1962. seedling size and soil moisture affect survival of loblolly pine sprouts. U. S. Forest Serv. Tree Planters' Notes 55, pp. 27-29, illus.
Heavily browsed seedlings often recover by sprouting and develop normally. Large seedlings and those clipped some distance above the ground are more likely to sprout than small or low-clipped seedlings.

▼Ursic, S. J.
1962. early survival of loblolly plantings on eroded lands. U. S. Forest Serv. Tree Planters' Notes 53, pp. 27-28.
Over several years, and on a variety of sites, first-year mortality in north Mississippi has averaged 19 percent; second- and third-year losses combined have averaged 6 percent.

Ursic, S. J.
1963. Kraft-polyethylene bags recommended for packing and storing loblolly seedlings. U. S. Forest Serv. Tree Planters' Notes 57, pp. 23-28, illus.
Bag-packed seedlings performed as well as those in Forest Service bales, and did not require water during storage either at 33°F. or in an unheated warehouse. A hydrophilic root spray did not improve keeping qualities.

Ursic, S. J.
1963. Modifications of planting technique not recommended for loblolly on eroded soils. U. S. Forest Serv. Tree Planters' Notes 57, pp. 13-17, illus.
No benefits derived from deep planting or from puddling or soaking of roots prior to planting.

Ursic, S. J.
1964. PACKING, SHIPPING, AND STORING LOBLOLLY SEEDLINGS IN KRAFT-POLYETHYLENE BAGS. Region 8 Forest Nurserymen's Conferences Proc. 1964: 65-67. U. S. Forest Serv. South. Region.
The bags protect the seedlings and facilitate storage and handling.

Ursic, S. J., Williston, H. L., and Burns, R. M.
1966. LATE PLANTING IMPROVES LOBLOLLY SURVIVAL. USDA Forest Serv. Res. Pap. SO-24, 12 p.
Also as LATE PLANTING IMPROVES SURVIVAL. Forest Farmer 26(9): 6-8, 16, 18. 1967.
In 10 years of field tests, late-planted loblolly pine seedlings that were properly packaged and stored survived better than seedlings planted in December. Late planting is recommended in all of loblolly's range south of Virginia but north of latitude 33°.

▼ Ursic, S. J., and Biesterfeldt, R. C.
1967. IT PAYS TO DELAY PINE PLANTING. Progr. Farmer, Ga.-Ala.-Fla. ed. 82(12): 28C, illus.
If seedlings are properly stored after being lifted from nursery beds, the planting season can be extended through March and early April.

Wakeley, P. C.
1968. REPLACEMENT PLANTING OF SOUTHERN PINES UNSUCCESSFUL. USDA Forest Serv. Res. Note SO-85, 4 pp.
Three decades' survival and growth of replacements planted at stand age 1 or 2 years were far inferior to those of the original trees. This was true regardless of plantation spacing, percentage of fail spots, or intensity of thinning.

Wakeley, P. C.
1969. POOR RETURNS FROM REPLACEMENT PLANTING. Forest Farmer 28(9): 6-7, 18.
See entry above.

Wakeley, P. C.
1969. RESULTS OF SOUTHERN PINE PLANTING EXPERIMENTS ESTABLISHED IN THE MIDDLE TWENTIES. J. Forest. 67: 237-241.
During 30 years in plantation in southeastern Louisiana, slash and loblolly pines outyielded longleaf and shortleaf but were far more susceptible to fusiform rust. In all four species, wide spacings excelled close spacings, and Grade 1 slash and loblolly seedlings excelled Grade 3 seedlings.

Wakeley, P. C.
1970. LONG-TIME EFFECTS OF DAMAGE BY RABBITS TO NEWLY PLANTED SOUTHERN PINES. USDA Forest Serv. Tree Plant. Notes 21(2): 6-9.
Loblolly and shortleaf pines that sprouted after having been bitten off during their first year showed negligible effects after 30 years in plantation. Slash pines similarly damaged survived and grew somewhat less well than undamaged seedlings, but the effects were not extreme.

Wakeley, P. C., and Barnett, J. P.
1968. VIABILITY OF SLASH AND SHORTLEAF PINE SEED STORED FOR 35 YEARS. J. Forest. 66: 840-841.
Unstratified samples of slash pine and shortleaf pine germinated 82 and 50 percent after 35 years in cold, dry storage.

Williston, H. L.
1962. CONIFERS FOR CONVERSION PLANTING IN NORTH MISSISSIPPI. U. S. Forest Serv. Tree Planters' Notes 54, pp. 5-7, illus.
Loblolly pine appears best.

Williston, H. L.
1962. LOBLOLLY SEEDLINGS SURVIVE TWELVE DAYS' SUBMERGENCE. Jour. Forestry 60: 412.
During their second growing season seedlings survived 12 days of submergence, but 21 days killed half of them and 30 days was fatal to nearly all. Dormant 1-year-old seedlings endured submergence for 32 days.

Williston, H. L.
1962. PINE PLANTING IN A WATER IMPOUNDMENT AREA. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 137.
Submergence for 3.5 months during the first winter killed planted loblolly and shortleaf pine seedlings in north Mississippi.

Williston, H. L.
1964. REFRIGERATOR-CAR STORAGE OF LOBLOLLY PINE SEEDLINGS HIGHLY SUCCESSFUL. U. S. Forest Serv. Res. Note SO-13, 3 pp., illus.
Seedlings stored in cars from 1 to 9 weeks before outplanting survived and grew as well as those held in a cold-storage room.

▼ Williston, H. L.
1964. SEEDLING STORAGE IN REFRIGERATOR CARS. U. S. Forest Serv. Tree Planters' Notes 65, p. 20.
In 1963, 25 million seedlings were stored for varying periods in railroad refrigerator cars. Cost was $0.22 per M for seedlings in bales or kraft-polyethylene bags.

Williston, H. L.
1965. MOSS NOT NEEDED IN KRAFT-POLYETHYLENE BAGS DURING LOBLOLLY PINE SEEDLING TRANSPORT AND COLD STORAGE. U. S. Forest Serv. Tree Planters' Notes 72, pp. 10-11.
Moss was unnecessary to bagged seedlings held in cold storage; it was helpful in bags of seedlings stored more than 8 weeks in a warehouse where the temperature was uncontrolled, and 10 pounds were better than 1.

Williston, H. L.
1967. clay slurry root dip impairs survival of loblolly pine seedlings in Mississippi. U. S. Forest Serv. Tree Planters' Notes 18(4): 28-30.
In north Mississippi, a kaolin clay root dip reduced survival of normally planted seedlings. The dip was advantageous when seedlings were exposed to sun and air for 30 to 60 minutes before planting, but survival of all exposed seedlings was inferior.

Williston, H. L.
1968. clearcutting and planting best for regenerating pine in northern Mississippi study. USDA Forest Serv. Res. Note SO-81, 5 pp.
Areas that had been clearcut of shortleaf and planted with loblolly pine were 58 percent stocked with dominant pines 10 years later. Satisfactory reproduction was not obtained after seed-tree, shelterwood, or selection cuttings.

Yocom, H. A.
1968. shortleaf pine seed dispersal. J. Forest. 66: 422.
Of seeds trapped in a forest opening in the Ouachita Mountains of Arkansas, half fell less than 1 chain from the forest walls and 85 percent fell within 2.5 chains.

HARDWOOD

Bonner, F. T.
1965. maleic hydrazide unsuitable for controlling height growth of green ash and shumard oak seedlings. USDA Forest Serv. Tree Plant. Notes 70, p. 11. *Also as* mh unsuitable in ash and oak test. Miss. Farm Res. 27(11): 3. 1964. *Also as* maleic hydrazide unsuitable for control of green ash and shumard oak height growth. Miss. Agric. Exp. Stn. Inform. Sheet 870, 1 p. 1964.
A maleic hydrazide spray (15,000 or 30,000 p.p.m.) prevented nursery seedlings from becoming over-large, but it also prevented the terminals from growing after the seedlings were outplanted.

▼ Bonner, F. T.
1965. seeding and planting southern hardwoods. Auburn Univ. Hardwood Short Course Proc. 1964: 28-40.
Review of planting and seeding trials, with guides drawn from present knowledge.

Bonner, F. T.
1966. survival and first-year growth of hardwoods planted in saturated soils. U. S. Forest Serv. Res. Note SO-32, 4 pp., illus.
Soil saturation for more than 3 months after planting reduced height, root, and diameter growth—but not survival—of sycamore, sweetgum, and Nuttall oak seedlings.

Bonner, F. T.
1967. germination of sweetgum seed in response to light. J. Forest. 65: 339.
Cold, moist stratification essentially removes the light requirement.

Bonner, F. T.
1967. handling hardwood seed. Southeast. Area Forest Nurserymen's Conf. Proc. 1966: 163-170. U. S. Forest Serv. Southeast. Area, State and Priv. Forest.
Collection, extraction and cleaning, storage, and stratification.

Bonner, F. T.
1967. ideal sowing depth for sweetgum seed. U. S. Forest Serv. Tree Planters' Notes 18(1): 17-18.
Where moisture conditions are closely controlled, ¼-inch is a good depth.

Bonner, F. T.
1967. responses of 1-year-old cottonwood to increasing soil moisture tension. U. S. Forest Serv. Res. Note SO-56, 3 pp., illus.
Cuttings potted in sandy loam and clay soils showed a sensitive control of water loss as soil moisture tensions increased.

Bonner, F. T.
1968. responses to soil moisture deficiency by seedlings of three hardwood species. USDA Forest Serv. Res. Note SO-70, 3 pp.
Growth of terminal shoots of potted sycamore, sweetgum, and Nuttall oak seedlings began to decrease when leaf water deficits reached 6 to 9 percent.

Bonner, F. T.
1968. water uptake and germination of red oak acorns. Bot. Gaz. 129: 83-85.
When pericarps were intact, water was absorbed by Nuttall, pin, cherrybark, and northern red oak acorns, mainly through the vascular openings of the cup scar. Uptake through the pericarp was greater for acorns with a thin waxy coating on the pericarp than for acorns with a heavy waxy coating. Splitting or removing the pericarp greatly speeded uptake.

Bonner, F. T.
1970. artificial ripening of sweetgum seeds. USDA Forest Serv. Tree Plant. Notes 21(3): 23-25.
Seeds collected as early as July 19 were ripened by storing the seedheads until late September in a cool, moist environment.

▼ Bonner, F. T.
1970. forest tree seeds. Short Course for Seedsmen Proc. 1970: 87-93.
Trade in tree seeds is small by agricultural standards but will increase as genetically improved stock becomes available.

Bonner, F. T.
1970. hardwood seed collection and handling. *In* Silviculture and management of southern

hardwoods, p. 53-63. La. State Univ. 19th Annu. Forest. Symp. Proc. 1970. La. State Univ. Press.

As hardwood forestry in the South is intensified, methods for collecting and processing seeds must be improved. A review of current practices and recent research findings indicates where research should be concentrated.

Bonner, F. T., and Broadfoot, W. M.

1967. GROWTH RESPONSE OF EASTERN COTTONWOOD TO NUTRIENTS IN SAND CULTURE. U. S. Forest Serv. Res. Note SO-65, 4 pp., illus.

In a greenhouse test, seedlings grew best when nutrient solutions contained 100 p.p.m. N, 75 p.p.m. P, and 100 p.p.m. K.

Bonner, F. T., and Farmer, R. E., Jr.

1966. GERMINATION OF SWEETGUM IN RESPONSE TO TEMPERATURE, MOISTURE STRESS, AND LENGTH OF STRATIFICATION. Forest Sci. 12: 40-43, illus.

Both total germination and rate of germination increased as temperatures were raised from 60-75 to 85-100° F. Increases in osmotic stress lessened total germination and rate of germination, and 15 atmospheres of stress completely inhibited germination. Raising the temperatures decreased the influence of osmotic stress, and lengthening the stratification time diminished both temperature and osmotic effects.

Bonner, F. T., and Gammage, J. L.

1967. COMPARISON OF GERMINATION AND VIABILITY TESTS FOR SOUTHERN HARDWOOD SEED. U. S. Forest Serv. Tree Planters' Notes 18(3): 21-23.

Cutting tests were best for sweetgum and Nuttall oak, while cutting or water germination gave equally good results on sycamore seed. Floating was best for eliminating bad willow oak acorns, and floating combined with visual inspection of sunken acorns was best for cherrybark oak.

Briscoe, C. B.

1969. ESTABLISHMENT AND EARLY CARE OF SYCAMORE PLANTATIONS. USDA Forest Serv. Res. Pap. SO-50, 13 pp.

American sycamore (Platanus occidentalis *L.) is amenable to plantation management because of its rapid growth and the simplicity with which it can be established and tended.*

Burns, R. M.

1967. GIBBERELLIC ACID STIMULATES GERMINATION OF SWEETGUM SEED. Forest Sci. 13: 438-439.

A K-salt in aqueous solution educed progressively higher germination in applications of 75, 150, and 225 p.p.m.; thereafter germination declined.

Farmer, R. E., Jr., and Bonner, F. T.

1967. GERMINATION AND INITIAL GROWTH OF EASTERN COTTONWOOD AS INFLUENCED BY MOISTURE STRESS, TEMPERATURE, AND STORAGE. Bot. Gaz. 128: 211-215, illus.

Chances for germination and early growth appear to be optimum between 27-32° C. and at less than 5 atmospheres' moisture stress.

▼Gammage, J. L., and Maisenhelder, L. C.

1962. EASY WAY TO SOW COTTONWOOD NURSERY BEDS. U. S. Forest Serv. Tree Planters' Notes 51, pp. 19-20, illus.

Catkins are hung on wires above the beds, and seed falls as the capsules open.

Johnson, R. L.

1962. WEED CONTROL AND SITE PREPARATION FOR NATURAL REGENERATION OF COTTONWOOD. South. Weed Conf. Proc. 15: 181-184.

Cutting shallow trenches with a bulldozer or giant plow achieves the three requisites for natural regeneration of cottonwood: a bare seedbed, removal of overstory other than seed trees, and freedom from weeds for at least a year.

▼Johnson, R. L.

1964. COPPICE REGENERATION OF SWEETGUM. Jour. Forestry 62: 34-35, illus.

Numerous thrifty sprouts developed when pole-sized sweetgums in Mississippi were cut to low stumps. At age 6 years, dominant sprouts averaged 16 feet tall on clay sites in a stream bottom and 22 feet on a moist silt loam in the uplands.

Johnson, R. L.

1965. REGENERATING COTTONWOOD FROM NATURAL SEEDFALL. J. Forest. 63: 33-36, illus.

On moist sites with an adequate seed source, eastern cottonwood can be regenerated by plowing parallel ditches about 8 inches deep and 6 feet wide. Ditches are most successful in forested areas (excluding old fields) and in silt or sandy loam soils. They can be made with a bulldozer blade or giant plow at one-third to one-half the cost of planting.

Johnson, R. L.

1967. IMPROVING GERMINATION OF NUTTALL OAK ACORNS. U. S. Forest Serv. Res. Note SO-66, 3 pp.

Best treatment was a combination of sowing 1 inch below the soil surface, under litter, and in partial shade.

Johnson, R. L.

1970. FIELD GERMINATION OF NUTTALL OAK ACORNS. USDA Forest Serv. Res. Note SO-101, 4 p.

In newly cleared plots on Sharkey clay, germination was as high as 79 percent for acorns sown unstratified in January and 86 percent for those stratified and sown in April. Germination was faster and more complete among acorns sown 1 and 2 inches deep than among those sown 4 inches deep.

Johnson, R. L.

1970. RENEWING HARDWOOD STANDS ON BOTTOM LANDS AND LOESS. *In* Silviculture and management of southern hardwoods, p. 113-121. La. State Univ. 19th Annu. Forest. Symp. Proc. 1970. La. State Univ. Press.

In slack-water and loess areas and in minor stream bottoms on the southern

Coastal Plain, adequate stocking of desirable species usually develops after hardwood stands are clearcut. Plantations have higher early yields than natural stands, but costs for establishment and care may exceed $100 per acre.

JOHNSON, R. L., AND BIESTERFELDT, R. C.
1970. FORESTATION OF HARDWOODS. Forest Farmer 30(2): 14-15, 36-38.
Southern hardwood stands can usually be reproduced by clearcutting merchantable stems and deadening any saplings or larger trees that remain. Methods have been developed for planting many hardwood species. Eastern cottonwood, sycamore, and yellow-poplar are being planted commercially.

▼ Johnson, R. L., and Krinard, R. M.
1963. Planted yellow-poplar outperforms six other species on loess sites. U. S. Forest Serv. Tree Planters' Notes 61, pp. 11-12, illus.
After 2 years in plantation, yellow-poplar trees averaged two to six times taller than southern red oak, cherrybark oak, water oak, swamp chestnut oak, Shumard oak, and sweetgum.

KEARNEY, N. S., JR., AND BONNER, F. T.
1968. SWEETGUM SEED PRODUCTION ON SOILS IN CENTRAL MISSISSIPPI. USDA Forest Serv. Res. Note SO-75, 2 pp.
During 1965 and 1966, sweetgum trees on Delta sites produced more seed than trees on loess and Coastal Plain sites. Speed and completeness of germination were about the same for the three sites.

KENNEDY, H. E., JR.
1970. GROWTH OF NEWLY PLANTED WATER TUPELO SEEDLINGS AFTER FLOODING AND SILTATION. Forest Sci. 16: 250-256.
In central Mississippi, outplanted water tupelo seedlings survived and grew well after shallow flooding (up to 8 cm.) from late February through June 1. Submersion of the seedlings, flooding until late in the growing season, reflooding, and moderate siltation reduced growth. Flooding caused changes in certain soil properties, but these changes did not seem to be the major cause of growth reductions.

MCKNIGHT, J. S.
1966. HINTS FOR DIRECT SEEDING SOUTHERN HARDWOODS. Proc., Direct Seeding Workshops, Alexandria, La., and Tallahassee, Fla., pp. 26-35. U. S. Forest Serv., Atlanta, Ga.
Summarizes present knowledge.

MCKNIGHT, J. S.
1970. PLANTING COTTONWOOD CUTTINGS FOR TIMBER PRODUCTION IN THE SOUTH. USDA Forest Serv. Res. Pap. SO-60, 17 p.
High yields of eastern cottonwood can be obtained through a combination of careful site selection, thorough site preparation, cultivation during the first year, and protection from insects and grazing animals. Early and frequent thinnings are needed, and pruning should be considered, where saw and veneer logs are grown. The paper presents instructions and cost estimates for recommended treatments.

MCKNIGHT, J. S., AND BIESTERFELDT, R. C.
1968. COMMERCIAL COTTONWOOD PLANTING IN THE SOUTHERN UNITED STATES. J. Forest. 66: 670-675.
Large plantations of eastern cottonwood are being established along the Mississippi River. High yields result from a combination of careful site selection, thorough site preparation, cultivation during the the first year, and protection from insects and deer.

▼ MCKNIGHT, J. S., and MAISENHELDER, L. C.
1962. CHANGE TO QUICK TREES. U. S. Forest Serv. Tree Planters' Notes 51, pp. 23-24, illus. *Also in* Forest Farmer 21 (13): 12, illus.
On suitable sites and with cultivation during the first year, cottonwood plantings make remarkable growth.

MAISENHELDER, L. C.
1969. IDENTIFYING JUVENILE SEEDLINGS IN SOUTHERN HARDWOOD FORESTS. USDA Forest Serv. Res. Pap. SO-47, 77 pp.
Photographs and a brief text describe cotyledons, leaves, stems, buds, and other characteristics useful in identifying first-year seedlings of 68 species.

▼ MAISENHELDER, L. C., AND MCKNIGHT, J. S.
1968. COTTONWOOD SEEDLINGS BEST FOR SITES SUBJECT TO FLOODING. USDA Forest Serv. Tree Planters' Notes 19(3): 15-16.
Rooted seedlings may be preferable to cuttings on sites likely to be flooded before the trees begin height growth.

▼ MIGNERY, A. L.
1962. OAK DIRECT SEEDING IN TENNESSEE. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 137.
Seeding was successful with white oak, but failed with red oak because small mammals ate the acorns or pulled up seedlings.

RUSSELL, T. E.
1966. DIRECT SEEDING HARDWOODS IN THE PIEDMONT AND MOUNTAINS. Proc., Direct Seeding Workshops, Alexandria, La., and Tallahassee, Fla., pp. 36-40. U. S. Forest Serv., Atlanta, Ga.
Much remains to be learned, but small trials with yellow-poplar, white ash, and black cherry may be worth while if seedbeds are well prepared, large amounts of seed are sown, and seedlings are given timely release.

RUSSELL, T. E.
1966. PLANTED YELLOW-POPLAR THRIVES ON TENNESSEE'S CUMBERLAND PLATEAU. KTG J. 6(4): 10-11, illus.
The trees survived well and are growing rapidly 5 years after being planted on a slope and a plateau-top site near Sewanee.

RUSSELL, T. E.
1968. TESTS OF REPELLENTS FOR DIRECT-SEEDING BLACK WALNUTS IN TENNESSEE. USDA Forest Serv.

Res. Note SO-73, 4 pp.
Arasan-endrin has provided fair protection for direct-seeded black walnuts on forested sites of the Cumberland Plateau.

Russell, T. E., Loftus, N. S., Mignery, A. L., and Smalley, G. W.
1970. planting yellow-poplar in central tennessee and northern alabama. USDA Forest Serv. Res. Pap. SO-63, 17 p.
In studies over a 10-year period, growth and survival were good on a wide range of wooded sites. When competing vegetation was controlled, success was achieved with ordinary seedlings planted by standard techniques.

Russell, T. E., and Rollins, G. V.
1969. in central tennessee oaks can be planted through midsummer. Forest Farmer 28(9): 14, 17.
White and black oaks have been successfully planted at monthly intervals from April through July on Tennessee's Cumberland Plateau.

GENETICS

GENERAL

Barber, J. C.
1965. progeny-testing forest trees for seed certification purposes. Forty-Sixth Ann. Rep. Int. Crop Impr. Assoc. 1964: 83-87.
Discusses general principles of establishing tests and indicates responsibilities of producer, buyer, and certifying agency.

▼Barber, J. C.
1966. a report on progress in forest genetics. Forest Farmer 26(2): 12-13, 37-38, illus. *Also as* a progress report on forest genetics. APA Quart., October 1966, pp. 4, 6.
General summary for the South.

▼Barber, J. C.
1966. genetics, seed orchards and forest farming. Forest Farmer 25(7): 104-105, illus.
Genetics research has provided the forest farmer with means of improving his timber stands and his income from forestry.

Barber, J. C.
1967. state and federal programs for southern forest tree improvement. Ninth Southern Conf. on Forest Tree Impr. Proc. 1967: 3-6, illus.
Thirty-five professional man-years annually are now devoted to this research, as contrasted to 4 man-years in 1950.

Barber, J. C., and Dorman, K. W.
1967. forest genetics publications by the southeastern and southern forest experiment stations, 1962 through 1966. U. S. Forest Serv. Res. Pap. SO-28, 23 pp.
Annotated bibliography.

▼Henry, B. W.
1963. Genetics and paper. Paper Mill News 86(39): 12-13, illus.
In years to come, genetics, and its manipulation through tree breeding, will be contributing to a stronger paper industry.

▼Henry, B. W., and Neelands, R. W.
1963. Institute of Forest Genetics revisited. Forest Farmer 22(8): 16-17, 26, illus.
Summary of progress since the Institute was established in 1955.

▼Namkoong, Gene.
1966. application of nelder's designs in tree improvement research. Eighth Southern Conf. on Forest Tree Impr. Proc. 1965: 24-37, illus.
The systematic designs make it possible to sample a range of spacings economically and with limited variation in the shape of the individual tree's growing space.

Namkoong, G.
1966. family indices for seed-orchard selection. *In* Joint Proc., Second Genet. Workshop of Soc. Amer. Forest. and Seventh Lake States Forest Tree Impr. Conf. U. S. Forest Serv. Res. Pap. NC-6, pp. 7-12, illus.
Data on the performance of relatives can be easily used for significant improvements in genetic gain by selection. In progeny-tested clonal seed orchards, at least two sources of data for selection can be combined in an index for gains of more than 100 percent over selection on progeny data alone. In seedling seed orchards, three sources of data are usable, and gain from index over tandem selection may be more than 100 percent.

Namkoong, G.
1966. inbreeding effects on estimation of genetic additive variance. Forest Sci. 12: 8-13, illus.
The value of open-pollinated seed for estimating the additive variance among families is diminished by a probable bias due to natural inbreeding. Several factors including nonadditive genetic effects, relatedness of neighboring trees, and failure to recognize any inbreeding tend to foster an overestimate of the true additive variance.

Namkoong, G.
1966. statistical analysis of introgression. Biometrics 22: 488-502, illus.
Measurements of introgression may be made on scales established by principal components, canonical correlation vectors, discriminant functions, hybrid indices, and a proposed distance analysis. The

distance analysis developed is the most sensitive scale used. When the methods were used on a set of data from introgression of two pine species, the failure of some of the assumptions was such as to lead to some differences in biological conclusions.

NAMKOONG, GENE.
1967. MULTIVARIATE METHODS FOR MULTIPLE REGRESSION PROVENANCE ANALYSIS. *In* 14th Congr. Proc., Int. Union Forest. Res. Organ. Vol. 3: 308-318, illus.
Some useful procedures in multivariate space are direct extensions of analogous univariate theory in both estimation and testing. The separation of within- and between-provenance genetic effects is then interpretable in terms of canonical or component analyses.

NAMKOONG, G.
1969. CHOOSING SELECTION INTENSITIES FOR SEEDLING SEED ORCHARDS. Silvae Genet. 18: 174-176.
Allocation of selection intensities can be optimized on the basis of gain per unit cost. Indications are that, as cost ratios and wood selection heritabilities rise, reliance should be increasingly placed on selection of suitable trees in the woods, rather than on selection following sib testing.

NAMKOONG, G.
1969. NONOPTIMALITY OF LOCAL RACES. Tenth South. Forest Tree Impr. Conf. Proc. 1969: 149-153.
If correlation between vigor and reproductive success is high, local provenances may have maximal vigor. If the correlation is poor, the breeder should consider selecting in regions of optimal ecological development and minimal environmental stress. His requirements for reproduction and timber production are separable.

NAMKOONG, G.
1970. OPTIMUM ALLOCATION OF SELECTION INTENSITY IN TWO STAGES OF TRUNCATION SELECTION. Biometrics 26: 465-476.
Discusses problem of estimating gain when sequential truncation selection is followed, and develops its solution in terms of bivariate truncation.

▼ NAMKOONG, G.
1970. PROBLEMS OF MULTIPLE-TRAIT BREEDING. *In* Second World Consult. on Forest Tree Breeding. Vol. 1, Sect. 2, p. 775-781. Wash., D. C.
In selecting weights to assign traits in tree breeding, high uncertainty about trait values and heritabilities may make maximization of minimal gains superior to maximization of expected gains.

NAMKOONG, G., BAREFOOT, A. C., AND HITCHINGS, R. G.
1967. PROBLEMS IN EVALUATING CONTROL OF WOOD CHARACTERISTICS THROUGH BREEDING. TAPPI 4th Forest Biology Conf. Proc. 1967: 131-142. Pulp and Pap. Res. Inst. Can., Pointe Claire, Quebec, Can.
Published data are insufficient to economically evaluate breeding control alternatives. The data that are available indicate that it would be more profitable to breed for gross fiber yield than wood specific gravity in loblolly pine. Before a rational selection program can be planned, geneticists must know what values to assign to wood quality traits.

NAMKOONG, G., BAREFOOT, A. C., AND HITCHINGS, R. G.
1969. EVALUATING CONTROL OF WOOD QUALITY THROUGH BREEDING. TAPPI 52: 1935-1938.
Present data indicate that, for loblolly pine, it would be more profitable to breed for gross fiber yield per acre than for an increase in wood specific gravity. Before a rational selection program can be planned, however, geneticists must have reliable estimates of the values that pulpmills will place on wood-quality traits.

NAMKOONG, G., AND MILLER, D. L.
1968. ESTIMATION OF NON-LINEAR PARAMETERS FOR A NON-ASYMPTOTIC FUNCTION. Biometrics 24: 439-440.
A least-squares estimation procedure can be used.

NAMKOONG, G., AND SNYDER, E. B.
1969. ACCURATE VALUES FOR SELECTION INTENSITIES. Silvae Genet. 18: 172-173.
Charts accompanying the article show selection intensities for proportions ranging from 0.0001 to 0.5 of large populations. A table, correct to 10^{-4}, is available on request.

▼ NAMKOONG, GENE, SNYDER, E. B., AND STONECYPHER, R. W.
1966. HERITABILITY AND GAIN CONCEPTS FOR EVALUATING BREEDING SYSTEMS SUCH AS SEEDLING ORCHARDS. Silvae Genet. 15: 76-84, illus.
Principles and formulas for comparing various breeding systems. No one breeding system appears superior under all variations of heritabilities and selection intensities.

NAMKOONG, G., AND SQUILLACE, A. E.
1970. PROBLEMS IN ESTIMATING GENETIC VARIANCE BY SHRIKHANDE'S METHOD. Silvae Genet. 19: 74-77.
Under certain restricted conditions, broad-sense heritabilities can be conveniently and inexpensively measured by Shrikhande's method.

▼ NEELANDS, R. W.
1962. A HUNDRED THOUSAND PEDIGREES. South. Lumberman 205(2561): 129-130, illus.
Research at the Institute of Forest Genetics. Also see entry under Southern Forest Experiment Station.

▼ SNYDER, E. B.
1966. LATTICE AND COMPACT FAMILY BLOCK DESIGNS IN FOREST GENETICS. *In* Joint Proc., Second Genet. Workshop of Soc. Amer. Forest. and Seventh Lake States Forest Tree Impr. Conf. U. S. Forest Serv. Res. Pap. NC-6, pp. 12-17.
Lattices are advocated for large tests that include many genotypes. Computer shortcuts are cited for layouts and analyses,

including analyses with missing plots. Compact family blocks are suggested for experiments such as provenance tests, where progenies from individual trees are kept separate within sources. In 12 of 17 U. S. forestry experiments these designs were over 10 percent more efficient than randomized blocks.

Southern Forest Experiment Station.
1962. THE SOUTHERN INSTITUTE OF FOREST GENETICS. U. S. Forest Serv. South. Forest Expt. Sta., 38 pp., illus.
Statement of the Institute's aims, plus synopses of its main studies.

Stephenson, G. K., and Snyder, E. B.
1969. GENETIC VARIATION—KEY TO SUPERIOR TREES. USDA Forest Serv. South. Forest Exp. Sta., 12 pp.
Pictorially explains how researchers study basic genetic variation in characters in order to gain knowledge for breeding improved trees.

PINE

▼ Allen, R. M.
1969. RACIAL VARIATION IN PHYSIOLOGICAL CHARACTERISTICS OF SHORTLEAF PINE ROOTS. Silvae Genet. 18: 40-43.
When seedlings from eight geographic sources were grown near Gulfport, Mississippi, significant differences were found in root respiration and in amount of indoleacetic acid (IAA) oxidase, peroxidase, an inhibitor of IAA oxidase, an elongation inhibitor, and a pigment.

Allen, R. M., and McGregor, W. H. D.
1962. SEEDLING GROWTH OF THREE SOUTHERN PINE SPECIES UNDER LONG AND SHORT DAYS. Silvae Genetica 11: 43-45, illus.
Loblolly pine from southerly seed sources made more height growth under long or short days than seedlings from more northern sources; growth patterns revealed the interaction of a photoperiodic control process and a seasonal rhythmic process. Shortleaf grown under short days exhibited a clinal pattern like that of loblolly, but under long days showed differences more suggestive of ecotypes. Longleaf grew larger under long days than under short, but showed no differences attributable to geographic source.

Barrett, J. P.
1963. Slash pine gum flow unaffected by seed origin. Forests and People 13(2): 18-19, illus. *Also in* Naval Stores Rev. 73(7): 4-5, illus.
In a plantation near Alexandria, Louisiana, no differences in gum yield were found among trees representing seven seed sources in the lower Coastal Plain.

Barrett, J. P., and Bengtson, G. W.
1964. OLEORESIN YIELDS FOR SLASH PINES FROM SEVEN SEED SOURCES. Forest Sci. 10: 159-164, illus.
Sources ranging from South Carolina to Florida and westward to Louisiana did not differ in yield under microchipping, nor in viscosity or exudation pressure of the resin. Individual trees varied greatly, their productivity being correlated with diameter, length of live crown, ratio of crown length to total height of tree, and resin viscosity.

Boyer, W. D.
1966. LONGLEAF PINE POLLEN DISPERSAL. Forest Sci. 12: 367-368, illus.
A high ratio of pollen drift to deposition and the high level of pollen found in an open area suggest that Pinus palustris *forests fill the air with pollen that travels for long distances, with density declining mostly through diffusion rather than fallout.*

▼ Boyer, W. D., and Evans, S. R.
1967. EARLY FLOWERING IN LONGLEAF PINE RELATED TO SEED SOURCE. J. Forest. 65: 806.
Trees of one seed source produced 71 percent of the female flowers on pines from 11 seed sources planted at two locations in Alabama.

Campbell, T. E., Hamaker, J. M., and Schmitt, D. M.
1969. LONGLEAF PINE × SHORTLEAF PINE—A NEW HYBRID. Bull. Torrey Bot. Club 96: 519-524.
Five specimens of the cross—a difficult one to make—are growing at Gulfport, Mississippi. Mean measurements of 19 characters establish that the trees are F_1 hybrids.

▼ Derr, H. J.
1963. Brown-spot resistance among F_1 progeny of a single, resistant longleaf parent. Forest Genet. Workshop Proc. 1962: 16-17. South. Forest Tree Impr. Com. and Soc. Amer. Foresters Tree Impr. Com.
The considerable resistance displayed by the wind-pollinated progeny indicates genetic control of this trait and hence the possibility of selection for resistant strains.

▼ Derr, H. J.
1966. LONGLEAF × SLASH HYBRIDS AT AGE 7: SURVIVAL, GROWTH, AND DISEASE SUSCEPTIBILITY. J. Forest. 64: 236-239, illus.
Hybrids planted in central Louisiana are demonstrating desirable characteristics of both parent species. They closely resemble longleaf pine in form and branching habits but start height growth immediately and grow almost as fast as slash pine. They appear less susceptible than their parents to the brown spot needle blight of longleaf and the fusiform rust of slash pine.

Derr, H. J., and Melder, T. W.
1970. BROWN-SPOT RESISTANCE IN LONGLEAF PINE. Forest Sci. 16: 204-209.
Field tests have shown that resistance to brown spot disease is heritable.

Dinus, R. J.
1969. TESTING SLASH PINE FOR RUST RESISTANCE IN ARTIFICIAL AND NATURAL CONDITIONS. Tenth South. Forest Tree Impr. Conf. Proc. 1969: 98-106.
Response to artificial inoculation appears to be a reliable index of field performance.

▼GRIGSBY, H. C.
1962. HOW TO PROPAGATE PLANTS BY AIR LAYERING. Forests and People 12(3): 22-23, illus.
Directions for air-layering pines.

▼GRIGSBY, H. C.
[1962.] PROPAGATION OF LOBLOLLY PINE BY CUTTINGS. Plant Propagators Soc. Proc. 11: 33-35.
Cuttings made in December have been rooted under mist in a sand-perlite mixture heated to about 75-80°F. IBA helps induce rooting..

GRISBY, H. C.
1964. FIXED-PIPE INSECTICIDE SPRAYERS PROTECT CONES OF TALL PLUS PINES. Jour. Forestry 62: 755, illus.
An insecticide misting system has been developed for permanent installation in tall trees. In 5 minutes the pipe in a 100-foot tree can be connected to a power sprayer and the spraying completed to control cone-infesting insects. The parts cost about $12.50.

GRIGSBY, H. C.
1966. CAPTAN AIDS ROOTING OF LOBLOLLY PINE CUTTINGS. Int. Plant Propagators' Soc. Proc. 15: 147-150, illus.
A combination of captan and IBA produced 40 percent rooting.

GRIGSBY, H. C.
1967. IRRIGATION AND FERTILIZATION OF SEED ORCHARDS. Southeast. Area Forest Nurserymen's Conf. Proc. 1966: 121-130. U. S. Forest Serv. Southeast. Area, State and Priv. Forest.
Mixed fertilizers, at the rate of 300 pounds or more per acre, increase seed production, but irrigation does not appear profitable in parts of the South that receive 50 inches or more of well-distributed rain annually.

GRIGSBY, H. C.
1969. EXOTIC TREES UNSATISFACTORY FOR FORESTRY IN SOUTHERN ARKANSAS AND NORTHERN LOUISIANA. USDA Forest Serv. Res. Note SO-92, 5 pp.
Trees of 140 species were tested, but after 9 to 12 years none were as large as native loblolly pine. A few showed promise for urban and environmental forestry.

GRIGSBY, H. C.
1970. PROGENY OF LOBLOLLY PINE WOLF TREES DIFFER LITTLE FROM AVERAGE PROGENY. USDA Forest Serv. Res. Note SO-107, 2 p.
Ten-year-old progeny of eight wind-pollinated wolf trees did not differ from woods-run controls in crown size, branch size, or natural pruning ability.

HARE, R. C.
1965. BREAKING AND ROOTING OF FASCICLE BUDS IN SOUTHERN PINES. J. Forest. 63: 544-546, illus.
Pinching the branch tips forced fascicle buds into active growth, but only 23 of 6,239 active-budded fascicles rooted when treated with a hormone and inserted in perlite under intermittent mist. Species, age, and season strongly influenced both breaking and rooting.

HARE, R. C., AND SWITZER, G. L.
1969. INTROGRESSION WITH SHORTLEAF PINE MAY EXPLAIN RUST RESISTANCE IN WESTERN LOBLOLLY PINE. USDA Forest Serv. Res. Note SO-88, 2 pp.
Electrophoretic patterns of seed proteins and similarities in morphological characteristics suggest introgression between western sources of loblolly pine and shortleaf pine.

▼Henry, B. W., and Jewell, F. F.
1963. Resistance of pines to southern fusiform rust. World Consultation on Forest Genetics and Tree Improvement, FAO, Stockholm, Sweden, August 23-30, 1963. 4 pp.
Resistance has been demonstrated from two sources: the shortleaf species and individual slash pines.

HENRY, B. W., AND WELLS, O. O.
1967. VARIATION IN BROWN-SPOT INFECTION OF LONGLEAF PINE FROM SEVERAL GEOGRAPHIC SOURCES. U. S. Forest Serv. Res. Note SO-52, 4 pp., illus.
In plantings in southern Mississippi, seedlings from seed sources near the western extremity of the range were generally more heavily infected than seedlings from the central part of the range.

▼Jewell, F. F.
1963. How can genetic control of diseases aid the forest manager? Seventh South. Forest Tree Impr. Conf. Proc. 1963: 25-26.
Disease-resistant trees may be among the earliest practical results of forest genetics research.

▼JEWELL, F. F.
1966. DISEASE AND INSECT RESISTANCE RESEARCH IN SOUTHERN UNITED STATES. *In* Breeding Pest-Resistant Trees, pp. 59-60. Oxford and New York: Pergamon Press.
A summary of current activity.

▼JEWELL, F. F.
1966. INHERITANCE OF RUST RESISTANCE IN SOUTHERN PINES. *In* Breeding Pest-Resistant Trees, pp. 107-109. Oxford and New York: Pergamon Press.
Artificial inoculation of slash pine with fusiform rust has identified individual parent trees that transmit a high degree of resistance to their progenies. Open pollinated progenies from these trees have about one-half the infection rate of progenies from susceptible parents.

▼JEWELL, F. F., AND MALLETT, S. L.
1964. RESISTANCE TO FUSIFORM RUST IN SLASH PINE AS SHOWN BY ARTIFICIAL INOCULATION. Phytopath. 54: 1294.
Individual slash pines vary in rust susceptibility and transmit their resistance to progeny, but progeny testing is necessary to determine the resistance or susceptibility of the parent.

JEWELL, F. F., AND MALLETT, S. L.
1967. TESTING SLASH PINE FOR RUST RESISTANCE. Forest Sci. 13: 413-418, illus.
Heritability of resistance to Cronartium fusiforme *has been demonstrated in nur-*

sery tests of open- and control-pollinated progenies.

Jones, E. P., Jr., and Wells, O. O.
1969. ICE DAMAGE IN A GEORGIA PLANTING OF LOBLOLLY PINE FROM DIFFERENT SEED SOURCES. USDA Forest Serv. Res. Note SE-126, 4 pp. Southeast. Forest Exp. Sta., Asheville, N. C.
In a planting in southcentral Georgia, damage was less among trees from the colder, more inland locations than among trees from coastal areas, but the superior growth rate of the coastal trees more than offset the greater damage they sustained.

McLemore, B. F., and Derr, H. J.
1965. LONGLEAF PINE CONE MATURITY IS INDEPENDENT OF POLLINATION DATE. Silvae Genet. 14: 133, illus.
Period of seed development is constant for individuals but varies between trees. The order of cone ripening is nearly identical from year to year.

McLemore, B. F., Derr, H. J., and Barnett, J. P.
1968. PRODUCING GENETICALLY IDENTICAL LONGLEAF PINE SEEDLINGS. Forest Sci. 14: 312-313.
Embryos of longleaf pine can be split to produce two identical seedlings. Cutting should be done in two stages, about 4 days apart, while the seed is germinating in a moist chamber.

Mergen, F., Snyder, E. B., and Burley, J.
1966. VARIATION IN COASTAL AND INSULAR SLASH PINE OF MISSISSIPPI AND ALABAMA. Amer. Midland Natur. 76: 482-495, illus.
Variations from north to south were found among 27 needle, twig, bud, and cone characters from 11 island, coastal, and inland collections of P. elliottii *Engelm.*

Mergen, F., Stairs, G. R., and Snyder, E. B.
1963. Microsporogenesis in Pinus echinata and Pinus taeda. Silvae Genet. 12: 127-129, illus.
Photomicrographs of major stages, and phenology in southern Mississippi.

Mergen, F., Stairs, G. R., and Snyder, E. B.
1965. NATURAL AND CONTROLLED LOBLOLLY × SHORTLEAF PINE HYBRIDS IN MISSISSIPPI. Forest Sci. 11: 306-314, illus.
Means for most of 20 vegetative characters of young F_1 hybrids were intermediate to those of the interplanted parental checks, while ranges overlapped. Separation of hybrids and parents was obtained by combining certain vegetative characters in pictorialized scatter diagrams. Length of male strobili was outstandingly discriminative as a single character.

Mignery, A. L.
1967. WINTER INJURY TO LOBLOLLY PINE IN TENNESSEE RELATED TO SEED ORIGIN. Southern Lumberman 215(2680): 146, illus.
Loblolly is a good choice for Tennessee, but seed for planting or sowing should be collected within the State or close to it.

Namkoong, Gene.
1965. COMMENTS ON "A ONE-PARENT PROGENY TEST AND SEED ORCHARD FOR THE IMPROVEMENT OF RED PINE." J. Forest. 63: 473-474.
In terms of genetic gain alone, clonal seed orchards can be highly superior to wind-pollinated seedling orchards.

Schmidtling, R. C.
1969. INFLUENCE OF ROOTSTOCK ON FLOWERING IN SHORTLEAF PINE. Tenth South. Forest Tree Impr. Conf. Proc. 1969: 229-230.
In limited tests, shortleaf pine scions flowered better on loblolly than on slash or shortleaf pine rootstocks.

Schmidtling, R. C.
1969. REPRODUCTIVE MATURITY RELATED TO HEIGHT OF LOBLOLLY PINE. USDA Forest Serv. Res. Note SO-94, 2 pp.
In a plantation in which plots were cultivated, fertilized, or both, initial flowering was closely related to tree height. Height at flowering age did not differ among cultural treatments that greatly influenced growth rates.

Schmidtling, R. C., and Scarbrough, N. M.
1968. GRAPHIC ANALYSIS OF ERAMBERT'S HYBRID. USDA Forest Serv. Res. Note SO-80, 3 pp.
The variability of progeny in needle length, fascicle sheath length, and number of stomates per row per centimeter indicates that Erambert's hybrid is a cross between longleaf and loblolly, i. e., Sonderegger pine. The analysis described should help identify other southern pine hybrids.

Schmitt, Dan.
1968. CROSSING THE SOUTHERN PINES. Southern Lumberman 217(2704): 107.
Four southern pine hybrids can be produced easily; three of them possess useful disease resistance and growth properties.

Schmitt, Dan.
1968. PERFORMANCE OF SOUTHERN PINE HYBRIDS IN SOUTH MISSISSIPPI. USDA Forest Serv. Res. Pap. SO-36, 15 pp.
On the basis of survival and resistance to fusiform rust, three interspecific pine hybrids—longleaf × slash, shortleaf × slash, and shortleaf × loblolly—merit further investigation. Site, cultural conditions, and especially individual seed and pollen parents affected performance. There are good possibilities for improvement by selection of individual parents.

Schmitt, D.
1969. NANISM IN SLASH × SHORTLEAF PINE HYBRIDS. Forest Sci. 15: 174-175.
In plantings in southern Mississippi, incidence of dwarfs among slash × shortleaf pine hybrids was higher than has previously been reported for gymnosperm populations. Many of the dwarfs were mixoploid.

Schmitt, Dan, and Namkoong, Gene.
1965. PINE SPECIES IN THE HARRISON EXPERIMENTAL FOREST ARBORETUM. U. S. Forest Serv. Res. Pap. SO-18, 18 pp., illus.

Pines of 45 species, 5 native and 40 nonnative, were planted between 1955 and 1962. Of the nonnatives, 20 failed, and none have approached slash pine in growth, although some have become reproductively mature.

SHOULDERS, EUGENE.
1965. SEED ORIGIN AFFECTS LONGLEAF PINE IN LOUISIANA PLANTATION. U. S. Forest Serv. Res. Note SO-19, 3 pp., illus.
Trees representing seed sources with mean annual temperatures of 60 to 67° F. had best 5-year survival. Those from regions with 17 to 20 inches of rain from January through April made the most height growth.

SHOULDERS, EUGENE.
1967. FERTILIZER APPLICATION, INHERENT FRUITFULNESS, AND RAINFALL AFFECT FLOWERING OF LONGLEAF PINE. Forest Sci. 13: 376-383, illus.
In a given year, the number of female strobili on individual trees in thinned and cultivated stands was influenced, in descending order of importance, by (1) inherent ability of trees to flower, (2) spring and early summer rainfall in year of flower bud formation, (3) annual rate of fertilizer application, and (4) flowering 2 years earlier.

SHOULDERS, EUGENE, AND TERRY, T. A.
1968. CLIMATE AT THE SEED SOURCE AFFECTS LONGLEAF PINE PERFORMANCE IN LOUISIANA PLANTATION. USDA Forest Serv. Res. Note SO-78, 5 pp.
Survivals at 5 and 10 years were correlated with mean annual temperature at the seed source. Height growth was associated with early-season rainfall at the seed source.

SMITH, H. D., AND SMITH, L. F.
1968. GRAFTING LONGLEAF PINE. USDA Forest Serv. Tree Planters' Notes 19(4): 21-23.
Cleft-grafts made by a method developed at the Institute of Forest Genetics have averaged 40 percent in first-year survival —adequate for seed-orchard purposes.

SMITH, L. F.
1966. EARLY FLOWERING IN LONGLEAF PINE. J. Forest. 64: 198-199, illus.
One tree bore female flowers after its fourth year in plantation, many trees had male or female flowers after the fifth year. Annual cultivation appears to promote early flowering in longleaf.

Smith, L. F., Snyder, E. B., and Scarbrough, N. M.
1963. Care of pine seedlings used in breeding at Institute of Forest Genetics. U. S. Forest Serv. Res. Note SO-2, 4 pp., illus. South. Forest Expt. Sta., New Orleans, La.
When grown in pots for a few months between lifting and outplanting, and cultivated and kept free of pests in plantation, longleaf seedlings averaged 95 percent in first-year survival and 94 percent of the survivors began height growth the second year.

SNYDER, E. B.
1968. SEED YIELD AND NURSERY PERFORMANCE OF SELF-POLLINATED SLASH PINES. Forest Sci. 14: 68-74.
Inbreeding does not appear to be a practical way of improving most characters of slash pine.

SNYDER, E. B.
1969. PARENTAL SELECTION VERSUS HALF-SIB FAMILY SELECTION OF LONGLEAF PINE. Tenth South. Forest Tree Impr. Conf. Proc. 1969: 84-88.
Studies indicate that both progeny-test and phenotypic selection for early height growth will be effective.

▼Snyder, E. B., and Allen, R. M.
1963. Sampling, nursery, and year-replication effects in a longleaf pine progeny test. Forest Genet. Workshop Proc. 1962: 26-27, illus. South. Forest Tree Impr. Com. and Soc. Amer. Foresters Tree Impr. Com.
Ten-year results from a comprehensive test illustrated the possibility of error or inefficiency from unrepresentative sampling, persisting effects of nursery environment, and indiscriminate replication by years.

SNYDER, E. B., AND ALLEN, R. M.
1968. MOUNTAIN LONGLEAF PINE EXCELS ONLY IN LOCAL PLANTINGS. USDA Forest Serv. Res. Note SO-83, 4 pp.
In reciprocal plantings of longleaf pine from the mountains of Alabama and the Gulf Coastal Plain in southern Mississippi, Alabama sources outperformed Mississippi sources only in the mountains.

SNYDER, E. B., AND HAMAKER, J. M.
1970. SPECIFIC GRAVITY AND FIBER LENGTH OF LOBLOLLY AND SPRUCE PINES ON THE SAME SITE. USDA Forest Serv. Res. Note SO-103, 3 p.
Among trees growing sympatrically in southern Mississippi, the average specific gravity of the outer wood was 0.46 for spruce pine and 0.54 for loblolly—a significant difference. Mean fiber length did not differ significantly between species. The small fiber variation among spruce pine trees indicates difficulty in selecting for genetic fiber-length differences in this species.

SNYDER, E. B., AND SQUILLACE, A. E.
1966. CONE AND SEED YIELDS FROM CONTROLLED BREEDING OF SOUTHERN PINES. U. S. Forest Serv. Res. Pap. SO-22, 7 pp.
Over a 10-year period, survivals of cones from controlled cross pollinations were less than 40 percent, and seed yields per cone averaged about half those from wind pollinations. Self pollinations produced about 15 percent as much seed as cross pollinations. Interspecific pollinations were generally less productive than intraspecific pollinations.

SNYDER, E. B., SQUILLACE, A. E., AND HAMAKER, J. M.
1966. PIGMENT INHERITANCE IN SLASH PINE SEEDLINGS. Eighth Southern Conf. on Forest Tree Impr. Proc. 1965: 77-85, illus.
Generalized findings were: (1) gene action similar to that for inbreeding depression underlying susceptibility to needle chlorosis; (2) disturbed monofact-

orial segregation ratios and nonallelism for albina-type mutants; (3) additive polygenic action and clinal variation for hypocotyl colors. A new method for estimating heritabilities and combining abilities utilizes combining abilities for each stand by averaging the wind-pollinated phenotypic values of the sampled trees per stand. Open pollinated progeny tests were highly efficient.

Snyder, E. B., Wakeley, P. C., and Wells, O. O.
1967. SLASH PINE PROVENANCE TESTS. J. Forest. 65: 414-420, illus.
Provenance plantings on favorable sites within the natural range of slash pine show little genetic variation in survival, growth, and resistance to the southern fusiform rust. North or west of the species' range, however, or on droughty sites anywhere, trees of northern or western provenance generally survive best. Almost all of the slash pine plantings established before 1940 and many even later were determined to be from seed collected in northeastern Florida and south Georgia.

Squillace, A. E., Bingham, R. T., Namkoong, Gene, and Robinson, H. F.
1967. HERITABILITY OF JUVENILE GROWTH RATE AND EXPECTED GAIN FROM SELECTION IN WESTERN WHITE PINE. Silvae Genet. 16: 1-6.
Narrow-sense heritabilities averaged about 7 percent, but appreciable genetic gains probably are possible nevertheless. A combination of phenotypic selection and progeny testing appears desirable.

▼ Squillace, A. E., Echols, R. M., and Dorman, K. W.
1962. HERITABILITY OF SPECIFIC GRAVITY AND SUMMERWOOD PER CENT AND RELATION TO OTHER FACTORS IN SLASH PINE. TAPPI 45: 599-601, illus.
Estimates of the heritability of specific gravity were roughly twice those of summerwood percent. Relations of between-tree variation in specific gravity to d.b.h. and to total height were weak to moderately strong, but appeared mainly phenotypic rather than genetic. Specific gravity was weakly related to summerwood percent—hence modest gains in specific gravity are possible through selection and breeding.

▼ Switzer, G. L., and Wells, O. O.
1964. SEED ORIGIN IMPORTANT IN PINE PLANTINGS. Miss. Farm Res. 27(5): 3, illus. *Also as* GEOGRAPHIC SEED ORIGIN AND EARLY PERFORMANCE OF LOBLOLLY PINE ON THE NORTHEAST MISSISSIPPI EXPERIMENTAL FOREST. Miss. Agr. Expt. Sta. Inform. Sheet 850, 2 pp., illus.
In a plantation in north-central Mississippi, trees from seed collected to the south and west have shown better volume growth and rust resistance than trees from seed collected in the eastern and central part of the loblolly pine range.

▼ Thames, J. L.
1962. LOBLOLLY BEST BUT SEED SOURCE IMPORTANT IN EROSION-CONTROL PLANTINGS IN NORTH MISSISSIPPI. U. S. Forest Serv. Tree Planters' Notes 55, pp. 21-22, illus.
Loblolly outgrew Virginia, shortleaf, and sand pine. Four loblolly seed sources were represented; the Lost Pines of Texas seemed best, northwest Georgia and east Texas were intermediate, and trees from seed collected in southern Arkansas grew the slowest.

Thames, J. L.
1963. Needle variation in loblolly pine from four geographic seed sources. Ecol. 44: 168-169, illus.
Trees representing dry portions of the species' range in Texas had fewer stomata, a thicker layer of epidermal cells, and more hypodermal cells than trees from southern Arkansas and northern Georgia. The Texas trees outgrew the others when planted on dry sites in north Mississippi.

Wakeley, P. C.
1963. How far can seed be moved? Seventh South. Forest Tree Impr. Conf. Proc. 1963: 38-43, illus.
Pending definitive results from provenance tests, the author hazards 10 recommendations concerning distances and directions that southern pine seed can be moved from source to planting site.

▼ Wakeley, P. C.
1963. NURSERY INFLUENCES AS A SOURCE OF ERROR IN PROVENANCE TESTS. Forest Genetics Workshop Proc. 1962. South. Forest Tree Impr. Com. and Soc. Amer. Foresters Tree Impr. Com.
Provenance tests should be designed to permit factoring out effects of variations in nursery environment, which may cause differences in survival and early growth of genetically identical stocks, or distort differences among genetically unlike stocks.

Wakeley, P. C.
1963. Reducing the effects of nursery influences upon provenance tests. Forest Genet. Workshop Proc. 1962: 28-32, illus. South. Forest Tree Impr. Com. and Soc. Amer. Foresters Tree Impr. Com.
Provenance tests should be designed to permit factoring out effects of variations in nursery environment, which may cause differences in survival and early growth of genetically identical stocks or distort differences among genetically unlike stocks.

Wakeley, P. C.
1968. RUST SUSCEPTIBILITY IN LONGLEAF PINE ASSOCIATED WITH BROWN-SPOT RESISTANCE AND EARLY COMMENCEMENT OF HEIGHT GROWTH. Forest Sci. 14: 323-324.
Among 1,300 planted pines at Bogalusa, Louisiana, susceptibility to southern fusiform rust was associated both with juvenile resistance to brown-spot needle blight and with early commencement of height growth.

Wakeley, P. C., and Bercaw, T. E.
1965. LOBLOLLY PINE PROVENANCE TEST AT AGE 35. J. Forest. 63: 168-174, illus.
At Bogalusa, La., trees of Arkansas, Texas, Georgia, and local Louisiana origin varied significantly in six economically important characters, including rust resistance. Louisiana stock excelled at all ages, but the Texas stock, next best at age 22, was subsequently outgrown by Georgia stock—an indication that conclusions drawn from provenance tests at 10 or 20 years may be premature.

Wakeley, P. C., Wells, O. O., and Campbell, T. E.
1966. MASS PRODUCTION OF SHORTLEAF × SLASH PINE HYBRIDS BY POLLINATING UNBAGGED FEMALE FLOWERS. *In* Joint Proc., Second Genet. Workshop of Soc. Amer. Forest. and Seventh Lake States Forest Tree Impr. Conf. U. S. Forest Serv. Res. Pap. NC-6, pp. 78-79, illus.
When slash pollen was dusted on the unbagged strobili of 10 shortleaf pines, 10.7 percent of the resulting seedlings were hybrid.

Wells, O. O.
1966. VARIATION IN RUST RESISTANCE AMONG PINE SEED SOURCES AND SPECIES IN A MISSISSIPPI PLANTING. Forest Sci. 12: 461-463, illus.
After 10 years there were significant differences in rust infection and height in a south Mississippi planting of Pinus elliottii, P. echinata, *and* P. taeda *from 11 seed sources. The slash pine was tallest and most infected; the shortleaf was shortest and had no rust cankers; and the loblolly was intermediate in both traits. Loblolly pines from seed collected west of the Mississippi River were more resistant to rust than eastern loblolly, and loblolly progenies from east Texas varied among themselves.*

Wells, O. O.
1969. RESULTS OF THE SOUTHWIDE PINE SEED SOURCE STUDY THROUGH 1968-69. Tenth South. Forest Tree Impr. Conf. Proc. 1969: 117-129.
Tenth-year data indicate that in some areas sizable genetic gain probably can be attained by moving seed considerable distances. In other situations, particularly near the northern limits of the species' ranges, no improvement over the local source appears possible. The data have permitted mapping suggested seed-collection and planting zones for loblolly, shortleaf, and longleaf pine.

▼Wells, O. O., and Wakeley, P. C.
1966. GEOGRAPHIC VARIATION IN SURVIVAL, GROWTH, AND FUSIFORM-RUST INFECTION OF PLANTED LOBLOLLY PINE. Forest Sci. Monogr. 11, 40 pp., illus.
Loblolly pines from 15 geographic seed sources, grown in 13 widely separated areas in the Southern United States, displayed well-defined patterns of variation after the first 10 years. In practically all plantings trees of western origin had survived best. In all but the coldest locations trees from coastal areas had grown fastest. Trees from western sources and from the one source farthest to the northeast were consistently least infected by fusiform rust.

Wells, O. O., and Wakeley, P. C.
1966. THE IMPORTANCE OF SEED SOURCES. Forest Farmer 26(2): 8-11, illus.
A popularized summary of the above Monograph.

Wells, O. O., and Wakeley, P. C.
1970. VARIATION IN LONGLEAF PINE FROM SEVERAL GEOGRAPHIC SOURCES. Forest Sci. 16: 28-42.
After 10 years in plantation, trees from 14 widely separated seed sources displayed well-defined variation in initiation of height growth, total height, volume, and infection by brown spot and fusiform rust. Trees from southern Florida performed poorly in all plantings. Gulf Coast trees from southern Mississippi, southern Alabama, and western Florida grew faster than others in plantings 150 miles north and 250 and 300 miles east and west of their point of origin. Farther north and west, trees of more local origin performed as well as or better than those from the central Gulf Coast.

Wells, O. O., and Wakeley, P. C.
1970. VARIATION IN SHORTLEAF PINE FROM SEVERAL GEOGRAPHIC SOURCES. Forest Sci. 16: 415-423.
Near the northern extremity of the range, 10th-year survival was better for trees of local origin than for trees from central or southern sources. Trees from the warmest parts of the range grew fastest in Coastal Plain plantings and in areas with mean annual temperatures as much as 6° F. below that where the seed was collected. By age 10 years, trees from northern sources had flowered more extensively than trees of southern origin.

HARDWOOD

Beland, J. W., and Jones, LeRoy.
1967. SELF-INCOMPATIBILITY IN SYCAMORE. Ninth Southern Conf. on Forest Tree Impr. Proc. 1967: 56-58, illus.
Only 0-2 percent of seed from self pollinations germinated normally, as compared to 30-80 percent of seed from flowers receiving a mixture of pollen.

Bonner, F. T.
1963. Some southern hardwoods can be air-layered. Jour. Forestry 61: 923.
In Mississippi air-layering succeeded in April and June on green ash, sweetgum, and cherrybark oak, and in August on green ash. It failed in all months on Nuttall oak and yellow-poplar. Indolebutyric acid stimulated callus growth but not rooting.

Broadfoot, W. M., and Farmer, R. E., Jr.
1969. GENOTYPE AND MOISTURE SUPPLY INFLUENCE NUTRIENT CONTENT OF EASTERN COTTONWOOD FOLIAGE. Forest Sci. 15: 46-48.
N, P, and K in foliage of young trees of Populus deltoides *Bartr. varied by clone. The soil moisture stress under which the leaves developed influenced foliar concentrations of N and P.*

▼Farmer, R. E., Jr.
1963. Distilled-water mist chamber for propagating greenwood cuttings. U. S. Forest Serv. Tree Planters' Notes 59, pp. 28-29, illus.
Construction and operation.

FARMER, R. E., JR.
1964. COTTONWOOD FLOWERING AS RELATED TO COLD REQUIREMENT OF FLOWER BUDS. Forest Sci. 10: 296-299.
A relatively long exposure to winter temperatures characteristic of the lower Mississippi Valley is required before buds will respond to forcing.

FARMER, R. E., JR.
1964. SEX RATIO AND SEX-RELATED CHARACTERISTICS IN EASTERN COTTONWOOD. Silvae Genetica 13: 116-118, illus.
Of 551 flowering trees selected at random in the Mississippi Delta, 54 percent were males. Males were insignificantly larger in diameter and significantly taller than females. Sex was not related to form class, stem straightness, branchiness, or specific gravity of the wood.

▼FARMER, R. E., JR.
1965. MIST PROPAGATION OF JUVENILE CHERRYBARK OAK CUTTINGS. J. Forest. 63: 463-464.
Greenwood apical cuttings from 1- to 4-month-old seedlings rooted in 4 weeks under mist, after being treated with indolebutyric acid.

▼FARMER, R. E., JR.
1966. COTTONWOOD IMPROVEMENT IN THE LOWER MISSISSIPPI VALLEY. Eighth Southern Conf. on Forest Tree Impr. Proc. 1965: 49-52.
Reviews silvical characteristics of cottonwood related to development and use of improved stock, patterns of natural variation, and nature of breeding systems currently in use. Initial research indicates broad variation in important characters. Productive breeding systems may vary from simple mass selection and clonal testing to long-range programs of recurrent selection.

FARMER, R. E., JR.
1966. GIBBERELLIN-INDUCED GROWTH OF DORMANT SWEETGUM. U. S. Forest Serv. Res. Note SO-42, 3 pp.
One-percent solutions of GA applied to leaves and buds of dormant seedlings caused growth resumption. Dimethyl sulfoxide (30 percent) and water with Tween 20 were equally effective as GA carriers and were both better than lanolin.

▼FARMER, R. E., JR.
1966. PROPAGATION OF SWEETGUM BY SOFTWOOD STEM CUTTINGS. Eighth Southern Conf. on Forest Tree Impr. Proc. 1965: 123-124.
When cuttings from root suckers were rooted under mist, a 1:1 mixture of sand and peat was a better medium than pure sand. Indolebutyric acid (50 p.p.m.) did not stimulate rooting.

▼FARMER, R. E., JR.
1966. ROOTING DORMANT CUTTINGS OF MATURE COTTONWOOD. J. Forest. 64: 196-197.
Untreated stem cuttings collected in early February rooted better than those taken in December, January, or early March. Flowering and foliation preceded rooting in March collections and diminished propagation success. Removal of flower buds increased rooting. Tree-to-tree variation in rooting was highly significant, as was the promotive effect of IBA. The overall effect of sex was insignificant.

▼FARMER, R. E., JR.
1966. VARIATION IN TIME OF FLOWERING AND SEED DISPERSAL OF EASTERN COTTONWOOD IN THE LOWER MISSISSIPPI VALLEY. Forest Sci. 12: 343-347, illus.
Flowering occurred from early March to early April; differences between trees within stands accounted for 98 percent of the variation. Trees within stands appeared to flower in predictable sequence. Dispersal lasted from mid-May to late August, with most of the variation accounted for by differences among trees.

FARMER, R. E., JR.
1967. GENETIC IMPROVEMENT OF SOUTHERN HARDWOODS: THE CURRENT STATUS OF RESEARCH. Area I Spring Meeting Southern Pulpwood Conserv. Assoc. Proc., 8 pp.
Research in hardwood genetics has been expanded greatly and should be yielding practical results within a decade.

▼FARMER, R. E., JR.
1968. CURRENT STATUS OF RESEARCH: GENETIC IMPROVEMENT IN SOUTHERN HARDWOODS. Forest Farmer 27(13): 6-7, 18-19.
Reviews current status of research.

FARMER, R.E., JR.
1970. GENETIC VARIATION AMONG OPEN-POLLINATED PROGENY OF EASTERN COTTONWOOD. Silvae Genet. 19: 149-151.
Family selection for foliation date, rust resistance, and specific gravity will probably be very effective. The very high broad-sense heritability of these characters suggests that selections can be made directly from natural stands.

FARMER, R. E., JR.
1970. VARIATION AND INHERITANCE OF EASTERN COTTONWOOD GROWTH AND WOOD PROPERTIES UNDER TWO SOIL MOISTURE REGIMES. Silvae Genet. 19: 5-8.
A pot study of Populus deltoides *clones evaluated genetic variation in drought resistance, leaf, stem, and root growth, shoot/root ratio, and wood properties.*

▼FARMER, R. E., JR., AND MOHN, C. A.
1970. GENETIC IMPROVEMENT OF EASTERN COTTONWOOD: A PROGRESS REPORT. *In* Silviculture and management of southern hardwoods, p. 5-17. La. State Univ. 19th Annu. Forest. Symp. Proc. 1970. La. State Univ. Press.
A review, with emphasis on work done over the past 5 years in the Mississippi River Valley.

Farmer, R. E., Jr., and Nance, W. L.
1968. crossing eastern cottonwood in the greenhouse. Int. Plant Propagator's Soc. Proc. 17: 333-338. Mobile, Ala.
Scions bearing female flower buds are bottle-grafted to potted juvenile stock in mid-autumn. After chilling requirements are met, flower buds on these scions are forced and pollinated in the greenhouse. Fruits are matured on the grafted scions.

Farmer, R. E., Jr., and Nance, W. L.
1969. phenotypic variation in specific gravity and fiber length of cherrybark oak. TAPPI 52: 317-319.
Variation patterns for both characters indicate that field selection of breeding material should be by individual trees.

Farmer, R. E., Jr., Russell, T. E., and Krinard, R. M.
1967. sixth-year results from a yellow-poplar provenance test. Ninth Southern Conf. on Forest Tree Impr. Proc. 1967: 65-68.
Juvenile height growth of yellow-poplar from Coastal Plain and Cumberland Plateau sources was similar in four plantings near seed origins. Major variation in growth was related to quality of planting sites. Trees of southern origin foliated earlier in the spring than those from northern sources.

Farmer, R. E., Jr., and Wilcox, J. R.
1964. cottonwood improvement system for commercial planters. U. S. Forest Serv. Res. Note SO-7, 3 pp., illus.
Simple procedure for identifying and propagating superior phenotypes.

Farmer, R. E., Jr., and Wilcox, J. R.
1965. specific gravity variation in a lower mississippi valley cottonwood population. Third Forest Biol. Conf. Proc., Tech. Assoc. Pulp and Pap. Ind. Pap. 3-3, 8 p. *Also in* TAPPI 49(5): 210-211. 1966.
The mean was 0.38 and the range 0.32 to 0.46.

Farmer, R. E., Jr., and Wilcox, J. R.
1966. variation in juvenile growth and wood properties in half-sib cottonwood families. *In* Joint Proc., Second Genet. Workshop of Soc. Amer. Forest. and Seventh Lake States Forest Tree Impr. Conf. U. S. Forest Serv. Res. Pap. NC-6, pp. 1-4.
Narrow-sense heritability estimates were: height, 0.35; diameter, 0.16; specific gravity, 0.62; fiber length, 0.40.

Farmer, R. E., Jr., and Wilcox, J. R.
1968. preliminary testing of eastern cottonwood clones. Theor. and Appl. Genet. 38: 197-201.
Clonal variation in the test population was great enough to permit improving genetic potential through selection. It appeared that greatest gains could be made in selection for resistance to Melampsora *rust and for tree volume.*

Maisenhelder, L. C.
1970. eastern cottonwood selections outgrow hybrids on southern sites. J. Forest. 68: 300-301.
Native selections of Populus deltoides *Bartr. grow faster on southern sites than any hybrids yet tested, have better stem form, and are more resistant to pests.*

Mohn, C. A., and Randall, W. K.
1969. preliminary selection of eastern cottonwood clones. Tenth South. Forest Tree Impr. Conf. Proc. 1969: 41-48.
Short-term tests can be effective in identification of clones with high growth potential. So far, evidence is conflicting with respect to the value of phenotypic selection for growth in natural stands.

Mohn, C. A., and Randall, W. K.
1970. flowering in young sweetgum plantations. Forest Sci. 16: 70-71.
Trees in west-central Mississippi began flowering in the fourth and fifth year after planting. The extent of early flowering was related both to planting site and inherent differences among trees.

Mohn, C. A., Randall, W. K., and McKnight, J. S.
1970. fourteen cottonwood clones selected for midsouth timber production. USDA Forest Serv. Res. Pap. SO-62, 17 p.
At age 5 years, the diameters of select clones averaged 13 and 20 percent greater than control diameters on two radically different sites. Superiority in height of select clones was approximately 10 percent on both sites.

Randall, W. K., and Mohn, C. A.
1969. clone-site interaction of eastern cottonwood. Tenth South. Forest Tree Impr. Conf. Proc. 1969: 89-91.
On Commerce silt loam and Sharkey clay near Greenville, Mississippi, clone-site interactions were large enough to warrant consideration in a breeding program.

Schmitt, D. M., and Webb, C.
1970. the relation of forest genetics research to southern hardwood tree improvement programs. *In* Silviculture and management of southern hardwoods, p. 89-100. La. State Univ. 19th Annu. For. Symp. Proc. 1970. La. State Univ. Press.
The authors review genetics research in southern hardwoods and suggest broad guides to accelerate southern hardwood tree improvement.

Schmitt, D., and Wilcox, J. R.
1969. sycamore variation in the lower mississippi valley. USDA Forest Serv. Res. Note SO-91, 6 pp.
Natural variation in 12 characters within and among three stands suggested that genetic improvement might best be accomplished by relaxed selection in natural stands, followed by intensive selection in foundation populations.

▼ Stairs, G. R., and Wilcox, J.
1968. intra-specific hybridization in tulip poplar.

Proc., Sixth World Forest. Congr., vol. 2, p. 1446-1448.

Growth rate of Liriodendron tulipifera *can probably be improved through intraspecific hybridization. Range-wide pollen shipment and short-term pollen storage are feasible.*

Toole, E. R.

1966. BREEDING FOR DISEASE AND INSECT RESISTANCE IN HARDWOODS. Eighth Southern Conf. on Forest Tree Impr. Proc. 1965: 20-24.

Brief review of methods, with examples.

Toole, E. R., and Darwin, W. N., Jr.

1970. INFLUENCE OF VARIATION IN PHYSICAL AND CHEMICAL PROPERTIES OF SOUTHERN RED OAK LUMBER ON DECAY RESISTANCE. Miss. State Univ. Forest Prod. Util. Lab. Res. Rep. 10, 8 p.

Susceptibility of the lumber to decay by brown-rot and white-rot fungi varied considerably among individual trees. The variability was probably due to genetic differences rather than to species and location of the trees.

Webb, C. D., and Farmer, R. E., Jr.

1968. SYCAMORE SEED GERMINATION: THE EFFECTS OF PROVENANCE, STRATIFICATION, TEMPERATURE, AND PARENT TREE. USDA Forest Serv. Res. Note SE-100, 6 pp. Southeast. Forest Exp. Sta., Asheville, N. C.

Percent and speed of germination were greater for seed from southern than from northern provenances.

▼ Wilcox, J. R.

1963. How can we improve southern hardwoods through genetics? Seventh South. Forest Tree Impr. Conf. Proc. 1963: 31-34.

Genetic improvement appears possible in yellow-poplar, cottonwood, and the oaks. For other important hardwoods, data are lacking on variations and patterns of inheritance.

Wilcox, J. R.

1966. SWEETGUM SEED QUALITY AND SEEDLING HEIGHT AS RELATED TO COLLECTION DATE. Eighth Southern Conf. on Forest Tree Impr. Proc. 1965: 121-123, illus.

In south Mississippi, the seed can be safely collected for 6 or 8 weeks following October 1. If seed weight and rate of germination are to be compared among lots, collections should be simultaneous.

Wilcox, J. R.

1966. VACUUM STORAGE OF YELLOW-POPLAR POLLEN. *In* Joint Proc., Second Genet. Workshop of Soc. Amer. Forest. and Seventh Lake States Forest Tree Impr. Conf. U. S. Forest Serv. Res. Pap. NC-6, pp. 102-103, illus.

Vacuum drying and storage at room temperature was not as effective as refrigerated storage but may be useful where long-distance transfer of pollen is anticipated.

▼ Wilcox, J. R.

1967. DURATION OF PISTILLATE FLOWER RECEPTIVITY IN SWEETGUM. Forest Sci. 13: 95-96, illus.

Flowers remained receptive for 3 weeks, commencing about 4 days prior to anthesis.

Wilcox, J. R.

1967. SEEDLINGS OF TWO LIQUIDAMBAR SPECIES COMPARED. Ninth Southern Conf. on Forest Tree Impr. Proc. 1967: 59-60.

In a southern Mississippi nursery, seedlings of Liquidambar formosana *Hance. and of* L. styraciflua *L. grew equally well during their first 2 years.*

Wilcox, J. R.

1968. SWEETGUM SEED STRATIFICATION REQUIREMENTS RELATED TO WINTER CLIMATE AT SEED SOURCE. Forest Sci. 14: 16-19.

After stratification, seeds from stands near the mouth of the Mississippi River germinated faster than seeds from stands farther north.

Wilcox, J. R.

1970. INHERENT VARIATION IN SOUTH MISSISSIPPI SWEETGUM. Silvae Genet. 19: 91-94.

Data from a half-sib progeny planting indicate that variation in growth and form of juvenile sweetgum is under strong enough genetic control to make possible considerable improvement through mass selection.

Wilcox, J. R., and Farmer, R. E., Jr.

1967. VARIATION AND INHERITANCE OF JUVENILE CHARACTERS OF EASTERN COTTONWOOD. Silvae Genet. 16: 162-165.

Forty-nine randomly selected clones were studied 2 years in a replicated test. Expected gains from selecting the best 10 percent were: total height 9.3 percent, stem diameter 11.5 percent, number of branches 19.0 percent, and incidence of Melampsora *rust 72.7 percent.*

▼ Wilcox, J. R., and Farmer, R. E., Jr.

1968. HERITABILITY AND C EFFECTS IN EARLY ROOT GROWTH OF EASTERN COTTONWOOD CUTTINGS. Heredity 23: 239-245.

Broad-sense heritability was 0.33-0.44 in a loam potting soil and 0.52-0.58 in Sharkey clay. Clonal variation in rooting was strongly related to heritable differences in foliation date. C effects were large enough to be important in short-term clonal tests.

Wilcox, J. R., and Farmer, R. E., Jr.

1968. VARIATION IN FIBER LENGTH OF EASTERN COTTONWOOD IN THE LOWER MISSISSIPPI VALLEY. TAPPI 51: 574-576.

Fiber length of individual trees varied from 1.13 to 1.50 mm. in the 8-10th annual rings to 1.24 to 1.72 mm. in the 28-30th rings. Most of the variation at 28-30 years was associated with individual trees rather than with site or geographical location.

PHYSIOLOGY

▼ Allen, R. M.
1964. contributions of roots, stems, and leaves to height growth of longleaf pine. Forest Sci. 10: 14-16.
Saplings made 31 percent of their normal spring elongation from food reserves in the stem. Roots supplied materials for an additional 15 percent, and old leaves for an apparent 40 percent.

Allen, R. M.
1967. influence of the root system on height growth of three southern pines. Forest Sci. 13: 253-257, illus.
Among grafted root-top combinations of Pinus elliottii *Engelm.,* P. taeda *L., and* P. echinata *Mill. growing under improved conditions, scions grafted on the rootstocks of faster growing species averaged little or no more height growth than on their own roots. Scions averaged less growth on rootstocks of slower growing species than on their own roots.*

Allen, R. M.
1969. contributions of tops and roots to variation in height growth of geographic sources of shortleaf pine. Silvae Genet. 18: 38-39.
In southern Mississippi, when local scions and those from seven other sources throughout the range of shortleaf pine were grown on their own and other rootstocks, geographic variation in height growth appeared to be primarily a function of tops rather than roots.

Allen, R. M., and Scarbrough, N. M.
1969. development of a year's height growth in longleaf pine saplings. USDA Forest Serv. Res. Pap. SO-45, 13 pp.
A detailed description of seasonal growth patterns of individual saplings.

Allen, R. M., and Scarbrough, N. M.
1970. morphology and length correlated in terminal flushes of longleaf pine saplings. USDA Forest Serv. Res. Pap. SO-53, 15 p.
When growing conditions were favorable, variation in node number accounted for three times more variation in flush length than did internode elongation. Over a range of annual environments, variation in node number accounted for 47 percent of the variation in length of the spring flush and 74 percent of that in summer flushes. In individual saplings, summer growth was negatively correlated with spring growth the following year.

Barnett, J. P., and Naylor, A. W.
1969. alcohol dehydrogenase activity and ethanol utilization in germinating longleaf and slash pine seeds. Forest Sci. 15: 400-403.
From start of germination to the 10th or 12th day, ADH activity increased slowly in the embryos of both species. As radicles emerged, activity more than doubled. Then, an epicotyl emergence was completed during the next 10 days, activity declined almost to zero.

Barnett, J. P., and Naylor, A. W.
1970. respiratory and biochemical changes during germination of longleaf and slash pine seeds. Forest Sci. 16: 350-355.
Between-species differences in respiratory activity and nitrogen metabolism indicate that metabolic pathways are differentially used during germination and early seedling development.

▼ Bassett, J. R.
1966. seasonal diameter growth of loblolly pines. J. Forest. 64: 674-676, illus.
On loessial soils in southeastern Arkansas (site index 90-100), 30-year-old stands thinned to 55, 80, and 125 square feet of basal area per acre completed 53 percent of their annual growth by May 31 and 68 percent by July 15. In dry years proportionately more growth occurred by these dates than in wet years.

▼ Blackmon, B. G., and Linnartz, N. E.
1970. a new sand-culture apparatus for tree nutrition research. La. Agr. Exp. Sta. LSU Forest. Notes 92, 4 p.
Directions for making and operating a simplified apparatus.

Boyer, W. D.
1970. shoot growth patterns of young loblolly pine. Forest Sci. 16: 472-482.
Most shoot elongation on loblolly pine seedlings and saplings occurred during the first growth flush, which began in early April and ended in mid-May near Durham, N. C. During this period, growth was rapid when daily temperatures were high, but increases in solar radiation depressed diurnal growth.

Farmer, R. E., Jr.
1968. sweetgum dormancy release: effects of chilling, photoperiod, and genotype. Physiol. Plant. 21: 1241-1248.
In Liquidambar styraciflua *L., 1,200 to 1,600 hours of chilling (3°C.) resulted in rapid resumption of growth under greenhouse forcing conditions. Long photoperiods were effective substitutes for chilling. Plants from southern Alabama (Lat. 31°) had a lower chilling requirement than those from western Tennessee (Lat. 36°).*

Farmer, R. E., Jr.
1969. transpiration and leaf temperature in east-

ERN COTTONWOOD. Forest Sci. 15: 151-153.

In summer at midday in central Mississippi, juvenile plants transpiring 10 to 16 × 10−6g/cm2/sec had leaves cooler than the surrounding air. Leaves transpiring less than 4 × 10−6g/cm2/sec were warmer than the surrounding air.

HARE, R. C.

1964. INDOLEACETIC ACID OXIDASE. Bot. Rev. 30: 129-165.

Survey of recent literature. This enzyme may be important in controlling auxin availability, thereby influencing growth, flower and root initiation, aging, photoperiodic and other photomorphogenic effects, apical dominance, abscission, and development of parasitically induced tumors. Other topics reviewed include distribution of the enzyme, its chemistry and mode of action, factors influencing its activity, and assay techniques.

HARE, R. C.

1966. PHYSIOLOGY OF RESISTANCE TO FUNGAL DISEASES IN PLANTS. Bot. Rev. 32: 95-137.

Discusses recent findings on such physiological resistance factors as hypersensitivity, phytoalexins, other toxins and inhibitors, phenolic metabolism as related to resistance, and host-parasite nutrition. Also includes literature dealing with metabolic and biochemical changes induced by infection, and the physiology of infection processes.

▼LEDIG, F. T., BORMANN, F. H., AND WENGER, K. F.

1970. THE DISTRIBUTION OF DRY MATTER GROWTH BETWEEN SHOOT AND ROOTS IN LOBLOLLY PINE. Bot. Gaz. 131: 349-359.

Current experimental results and data reanalyzed from the literature suggest that relative growth of shoot to root in pine is surprisingly constant under the usual conditions of culture.

MCCLURKIN, I. T., AND MCCLURKIN, D. C.

1967. CYTOCHEMICAL DEMONSTRATION OF A SODIUM-ACTIVATED AND A POTASSIUM-ACTIVATED ADENOSINE TRIPHOSPHATASE IN LOBLOLLY PINE SEEDLING ROOT TIPS. Plant Physiol. 42: 1103-1110, illus.

The sodium-activated enzyme system may be a mechanism for salt entry into plant roots. Presence of a potassium-activated enzyme only in the mycorrhizae may relate to the dependence of pines on mycorrhizae for growth.

▼ZAHNER, ROBERT.

1962. TERMINAL GROWTH AND WOOD FORMATION BY JUVENILE LOBLOLLY PINE UNDER TWO SOIL MOISTURE REGIMES. Forest Sci. 8: 345-352, illus.

During 2 years of soil-moisture treatment in large containers, 5-year-old pines with ample moisture produced 4 internodes annually, as compared to 2 for trees not watered in summer. Gross radial growth was twice as great for wet as for dry trees, but net latewood band was equal. Wet trees continued to form earlywood well into summer, while dry ones began latewood formation in spring. Specific gravity of latewood was greater in dry trees than in wet; in earlywood there were no differences.

ECONOMICS

ANDERSON, W. C.

1967. UPCOMING WOOD-PROCUREMENT PROBLEMS FOR ALABAMA PINE SAWMILLS. Ala. Forest Prod. 10(7): 25-27, illus.

If they are to outbid other industries for open-market timber, sawmills must improve their competitive position by increasing product value or reducing costs.

ANDERSON, W. C.

1968. FACTORS INFLUENCING NORTH CAROLINA LANDOWNERS TO PRACTICE FORESTRY. USDA Forest Serv. Res. Pap. SO-33, 18 pp.

Among private, nonindustrial owners, holders of share-tenant farms were most inclined to plant trees and thin their woodlands. Other owners holding farms they did not personally operate tended to thin rather than to plant. Owners who planted were chiefly those with idle farms. In their selection of practices, most owners were guided by economic objectives.

ANDERSON, W. C.

1968. HOW SOUTHERN PINE SAWMILLS CAN MEET COMPETITION FOR TIMBER. Southern Lumberman 217(2704): 147-150.

Competition for timber in the South will be intense in years just ahead. Lumbermen can compete for logs with rival forest industries if they will increase product value and reduce costs.

ANDERSON, W. C.

1968. MEETING COMPETITION FOR SOUTHERN PINE TIMBER. Forest Prod. J. 18(8): 6-9.

Pulpmills, sawmills, and plywood plants in the South are finding it increasingly difficult to satisfy their short-term needs for raw material. To survive the competition for timber immediately ahead, sawmills in particular will have to improve their procurement and manufacturing methods.

ANDERSON, W. C.

1968. RATING INVESTMENTS FOR IMPROVING GEORGIA TIMBER STANDS. Land Econ. 44: 121-127.

Internal rates of return from investments in timber stand improvement in loblolly-shortleaf pine stands were extremely

high, while capital requirements were low. Short investment periods were possible because the stands treated were already of merchantable size. This forestry practice should be attractive to owners of nonindustrial forest land.

ANDERSON, W. C.
1969. DETERMINANTS OF SOUTHERN PINE PULPWOOD PRICES. USDA Forest Serv. Res. Pap. SO-44, 10 pp.
Volume sold, size of sale area, interaction of total volume and volume per acre, number of buyers, and month of sale accounted for 56 percent of the price variation and predicted price per cord.

ANDERSON, W. C.
1969. PINE SAWTIMBER PRICE BEHAVIOR IN SOUTH CAROLINA. USDA Forest Serv. Res. Pap. SO-42, 12 pp.
Major determinants of price for pine sawtimber tracts are volume per tree and volume per acre, lumber market conditions, and section of the State in which the stumpage is located. Volume per acre influences number of bidders competing for the timber.

ANDERSON, W. C., AND GUTTENBERG, S.
1970. SOUTHERN LUMBERMEN TO BENEFIT PULP INDUSTRY. APA Quart. Pap. 69-15, p. 13-14. *Also in* Pulpwood Prod. 18(2): 42-43.
Wood-procurement problems of the pulp industry will be eased by a modest increase in southern pine lumber production combined with changes in logging and sawing technology.

ANDERSON, W. C., AND KAISER, H. F., JR.
1970. ECONOMIC IMPLICATIONS OF CHIPPING HEADRIGS FOR MILLING SOUTHERN PINE. Forest Prod. J. 20(3): 42-46.
Analysis by linear programming indicated that where small logs predominate a sawmill can be most advantageously built around a chipping headrig, with a conventional side omitted.

▼BAIRD, C. O.
1965. GAUGING THE POTENTIAL INVESTMENT EFFICIENCY OF THE FOREST RESOURCE IN A DEPRESSED AREA—A STUDY IN METHODOLOGY WITH APPLICATION TO THE CUMBERLAND PLATEAU SECTION OF APPALACHIA. Duke Univ. Sch. Forest. Bull. 17, 133 pp., illus.
Develops a model for classifying the region's forest land according to variables affecting the cost of growing stumpage. The region's depressed state is partially accounted for by the depletion of its forests; the capital investment needed to improve the forests is estimated at $100 million.

DUERR, W. A., AND GUTTENBERG, SAM.
1968. CONVERSION SURPLUS AS A MEASURE OF VALUE. Forest. Chron. 44(4): 24-27.
Conversion surplus is a measure of a producer's prospective gain or loss from converting goods in process (e. g., standing timber, logs) to end products.

▼DUERR, W. A., TEEGUARDEN, D. E., AND GUTTENBERG, SAM.
1968. DECISION MAKING IN FOREST RESOURCE MANAGEMENT. J. Forest. 66: 760-763.
Introduces an issue of the Journal devoted to decision theory. Emphasis is on the firm, the interdependence of its decisions, and problems of forecasting amidst uncertainty.

▼DUTROW, G. F.
1970. ECONOMIC ANALYSIS OF COTTONWOOD PLANTATIONS. *In* Silviculture and management of southern hardwoods, p. 39-50. La. State Univ. 19th Annu. Forest. Symp. Proc. 1970. La. State Univ. Press.
On good sites in the Mississippi Delta capital investments in intensive cottonwood culture are likely to yield high rates of return. Probable rates of return decline rapidly as site quality decreases.

DUTROW, G. F.
1970. PAY-OFFS IN COTTONWOOD. S. Lumberman 221 (2752): 115-116.
See entry below.

DUTROW, G. F., MCKNIGHT, J. S., AND GUTTENBERG, S.
1970. INVESTMENT GUIDE FOR COTTONWOOD PLANTERS. USDA Forest Serv. Res. Pap. SO-59, 15 p.
Although initial investments for land clearing, planting, and cultivation are high, the rapid growth of cottonwood permits rates of return up to 16 percent on the best sites.

FASICK, C. A., AND GUTTENBERG, SAM.
1966. PRICE COMPARISONS FOR PINE VENEER BOLTS, SAW LOGS, AND PULPWOOD. Forest Prod. J. 16(12): 56-58, illus.
Principles of preparing price-comparison curves are illustrated for various bolt markets, but they can be applied to any forest product. The resulting charts are useful to buyers as well as sellers of timber.

FASICK, C. A., AND SAMPSON, G. R.
1966. APPLYING LINEAR PROGRAMMING IN FOREST INDUSTRY. U. S. Forest Serv. Res. Pap. SO-21, 12 pp., illus.
Step-by-step instructions for preparing input data cards and interpreting computer output.

FASICK, C. A., AND SAMPSON, G. R.
1966. PRICE BEHAVIOR OF PINE PULPWOOD STUMPAGE FROM NATIONAL FORESTS IN MID-SOUTH: 1955-1965. Pulpwood Prod. 14(3): 18, 20, illus.
Prices ranged widely. Differences were largely due to shifting pulpwood procurement patterns and the changing demand for roundwood.

▼GUTTENBERG, SAM.
1966. FROM BARE LAND TO FOREST. Forest Farmer 25(7): 38-39, illus.
Provides a recipe for developing a profitable loblolly pine plantation.

GUTTENBERG, S.

1966. SOUTH'S TIMBER ECONOMY TO RISE. Southern Lumberman 212(2641): 16-18, illus.

Briefly examines wood consumption trends in the past several decades and relates them to southern forests and forest owners.

GUTTENBERG, SAM.

1967. CONVERTING FOREST RESOURCE STATISTICS TO TIMBER SUPPLY. Proc. Seventh Conf. on Southern Ind. Forest Manage., pp. 46-51. Duke Univ.

In industrial application Forest Survey statistics must be converted to timber supply—the portions of the resource economically available for processing in the short run. Questions for the analyst to consider and suggestions on how to adjust and supplement Survey data are given.

GUTTENBERG, S.

1967. ECONOMIC IMPLICATIONS OF WEIGHT SCALING. South. Lumberman 214(2663): 33-34, 36. *Also in* Ala. Forest Prod. 11(7): 52-54. 1968.

Advantages of buying and selling timber by weight, and main methods of converting weights to volumetric measures.

GUTTENBERG, S.

1967. GROWTH PROSPECTS FOR THE FOREST INDUSTRIES IN THE SOUTH. *In* Meeting the Challenge of Today's Markets, pp. 166-171. Proc. 4th Annu. Forest Ind. Marketing Conf. Univ. Oregon. *Also in* Southern Lumberman 215(2670): 20, 22. *Summarized in* Oregon Bus. Rev. 26 (9): 1-3.

Although not approaching the West in the size of their sawtimber, the forest industries of the South have a number of important advantages which favor a simultaneous increase in forest inventories and cut. Rapid growth rates permit short rotations, the timber is accessible for yearlong logging and is close to principal markets, and growing stock is young and can be easily increased by intensive forest management.

GUTTENBERG, SAM.

1968. HOW INCREASED PULPWOOD DEMAND CAN IMPROVE THE WEST GULF TIMBER SUPPLY. Forest Farmer 27(9): 6-7.

Its management programs, growing stock, and distribution of industries give the West Gulf an excellent chance to further increase forest inventories, growth, and cut.

GUTTENBERG, S.

1969. FORESTRY GOALS AND PRACTICES ON LARGE OWNERSHIPS IN THE SOUTH. J. Forest. 67: 456-461.

A questionnaire survey of ownerships with at least 10,000 acres of fee-simple and leased land indicates that these holdings —42 million acres in total—should be essentially regulated within 20 years. Toward the end of this time span, the annual yield from these forests alone should equal the South's total harvest in 1962.

▼GUTTENBERG, S.

1970. CASE FOR PRECOMMERCIAL THINNING. Forest Farmer 29(11): 13, 18.

Twenty years of data from plots in central Mississippi show that precommercial thinning is a good investment in overstocked stands of loblolly reproduction.

GUTTENBERG, S.

1970. ECONOMICS OF SOUTHERN PINE PULPWOOD PRICING. Forest Prod. J. 20(4): 15-18.

The industry practices price leadership in paper markets and in wood buying, but the gains from such policies have largely disappeared. Competition for stumpage and labor is upping wood costs, and competitive materials set limits on paper prices. Moreover, small margins typify most aspects of the industry. Financial success for timber growers, pulpwood producers, and the pulp and paper makers thus depends mainly on volume of business.

GUTTENBERG, S.

1970. PROSPECTS FOR THE SOUTHERN PINE PLYWOOD INDUSTRY. Forest Prod. J. 20(10): 12-14.

Liquidation of overmature pine stands and continued development of assured timber supplies will get the South's output of plywood to 6 billion square feet by the middle 1970's. Rapid expansion of processing complexes designed to utilize open-market stumpage may well push production to 8 billion feet later this decade.

▼GUTTENBERG, S., AND FASICK, C. A.

1965. WHAT DECIDES SOUTHERN PINE STUMPAGE PRICES? Forest Ind. 92(13): 46-47, illus.

Prices for sawtimber vary with the wholesale lumber market, number of bidders, and timber quality.

GUTTENBERG, SAM, AND FASICK, CLYDE.

1968. ECONOMICS OF PLYWOOD PRODUCTION IN THE SOUTHERN PINE REGION. Forest Prod. J. 18(5): 43-47.

Linear programming models for analyzing production possibilities were developed for a complete line of softwood plywood.

▼HOLLEY, D. L., JR.

1969. PLYWOOD'S ABILITY TO COMPETE FOR SOUTHERN PINE STUMPAGE. South. Lumberman 219(2728): 177-179.

Lower wage rates and nearness to markets allow southern plywood manufacturers to offer buyers a lower price than western mills can do, and thus to assure a market. The same cost advantages enable southern mills to pay prices that will secure them adequate stumpage.

HOLLEY, D. L., JR.

1969. POTENTIAL GROWTH OF THE SOUTHERN PINE PLYWOOD INDUSTRY. USDA Forest Serv. Res. Pap. SO-41, 22 pp.

Timber supplies and costs of logging, manufacturing, and transportation were evalu-

ated for the South, west coast, and Rocky Mountains by linear programming. The results indicate that by 1975 the South will be supplying 30 percent of the Nation's softwood plywood, while maintaining its current proportion of lumber output.

HOLLEY, D. L., JR.
1970. FACTORS IN 1959-69 PRICE RISE IN SOUTHERN PINE SAWTIMBER ANALYZED. Forest Ind. 97(4): 40-41.
Statistical analysis showed that fluctuations in the price paid for southern pine sawtimber stumpage in the Midsouth are caused by fluctuations in the current lumber price, sale volume, quality of the timber, and number of bids. In Louisiana stumpage prices have been pushed up by the pine plywood industry.

HOLLEY, D. L., JR.
1970. LOCATION OF THE SOFTWOOD PLYWOOD AND LUMBER INDUSTRIES: A REGIONAL PROGRAMMING ANALYSIS. Land Econ. 46: 127-137.
A linear programming model demonstrates that the current location of lumber and plywood production in the U. S. is inefficient and unstable. The plywood industry's shift into the South is a move toward equilibrium. The model's results justify more intensive forest management in the South than in other regions.

KAISER, H. F., JR.
1968. INTERINDUSTRY MODEL OF THE U. S. FOREST PRODUCTS ECONOMY. Forest Prod. J. 18(11): 15-18.
An input-output model shows the flow of goods through the forest products economy; data from the 1963 Census of Manufactures are used to analyze each forest industry's contribution.

KAISER, H. F., JR.
1969. INPUT-OUTPUT ANALYSIS OF THE SOUTHERN FOREST ECONOMY, 1963. USDA Forest Serv. Res. Pap. SO-43, 18 pp.
Analysis of unpublished data from the 1963 Census of Manufactures indicates that primary processing industries produced $5,126 million worth of output while purchasing stumpage costing $335 million. Secondary processing industries converted a portion of this output into products worth $3,365 million. Collectively, forest-related industries paid $2,181 million in wages to southerners.

KAISER, H. F., AND GUTTENBERG, S.
1970. GAINS IN LABOR PRODUCTIVITY BY THE LUMBER INDUSTRY. S. Lumberman 221(2747): 15, 18.
Chiefly by mechanization, the U. S. lumber industry substantially improved manpower efficiency in the years between 1954 and 1967.

▼ KAISER, H. F., JR., AND JONES, C. A.
1969. CHIPPING HEAD-RIGS CAN HELP MAINTAIN PROFITS IN SOUTHERN SAWMILLS. South. Lumberman 219(2728): 141-142.
High-speed systems built around chipping headrigs are well adapted for processing small saw logs.

NELSON, T. C.
1967. THE FOREST SITUATION IN THE SOUTH. Forest Farmer 27(3): 9-10.
New programs for intensifying forestry on small ownerships must be developed if the South is to grow its full share of the Nation's future timber supply.

PLEASONTON, ALFRED.
1967. THE FORESTRY CONSULTANT: AN ANALYSIS. Forest Farmer 27(1): 10, 12, 19, illus.
About 370 people in 278 firms are available for consulting in the South. Most offer a range of commonly requested services and many are willing to work on small tracts.

PLEASONTON, ALFRED.
1968. SOUTHERN CONSULTING FIRMS, 1966. The Consultant 13(2): 14-19.
Answers from questionnaires and interviews indicate the services provided by the 373 consultants in 278 consulting firms in the South in 1966.

PLEASONTON, A.
1969. SOUTHERN FORESTRY CONSULTANTS AND THEIR VIEWS. J. Forest. 67: 658-660, 664, 666, 668-672.
A well-qualified corps of consulting foresters is developing in the South. Consultants feel competition from public and private forestry programs but also recognize that such programs are needed.

▼ REYNOLDS, R. R., and ROW, CLARK.
1962. HOW MANY JOBS CAN A WELL MANAGED FOREST PROVIDE? Forests and People 12(4): 30-33, illus.
More than 100,000 workers are now employed in growing and manufacturing timber in Louisiana, Arkansas, east Texas, and southeast Oklahoma. With increased mechanization and cost reduction, product development, and further improvement of timber resources, the area's forests can provide a job for every 240 acres—a doubling of present employment.

ROW, CLARK.
1962. CANADIANS PUSH LUMBER SALES IN U. S. MARKETS. South. Lumberman 204(2542): 27-29, illus.
Canada now sells half as much lumber in the U. S. as does the southern pine industry. Import trends and sawtimber resources suggest that competition from Canadian softwood lumber will increase.

ROW, CLARK.
1962. MIDSOUTH NOW PREDOMINANTLY URBAN. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 140.
Midsouth population rose 9 percent between 1950 and 1960; the proportion dwelling in cities and towns climbed from 44 to 55 percent.

▼ ROW, CLARK.
1962. WHERE DOES SOUTHERN PINE SELL BEST? South. Lumberman 205(2561): 105-106, illus.
For five types of lumber, maps show where retail dealers sell mostly southern pine, Douglas-fir, ponderosa pine, or other softwoods.

Row, Clark.
1963. Determining forest investment rates-of-return

by electronic computer. U. S. Forest Serv. Res. Paper SO-6, 13 pp., illus. South. Forest Expt. Sta., New Orleans, La.

A program, written in FORTRAN, is available at the Southern Forest Experiment Station for computing rates-of-return for complex forest-investment alternatives. It will evaluate six investment alternatives simultaneously and perform the analyses repetitively for many cost and price situations.

▼Row, Clark.

1963. Problems in promoting new wood products. South. Lumberman 207(2585): 91-93, illus.

For manufacturers who sell only standard lumber, promotion of new products may mean radical changes in marketing policy. Among the problems are reaching particular markets with specialized items; meeting building-code and inspection regulations; and creating a prompt, efficient distribution system adapted to the volatile building materials market.

▼Row, Clark.

1963. Regional competition in softwood lumber. Soc. Amer. Foresters Proc. 1962: 97-103, illus.

The widespread internal change of the last decade will continue. Increased timber supplies, trends in regional production and freight costs, characteristics of lumber species in relation to demand, and the shifting geography of lumber consumption favor the western pine region, southern States west of the Mississippi, and Canadian imports.

▼Row, Clark.

1964. CHANGING RETAIL MARKETS. Forest Farmer 24(2): 6-7, 18, illus.

See entry below.

Row, Clark.

1964. CHANGING ROLE OF RETAIL DEALERS IN LUMBER MARKETING. U. S. Forest Serv. Res. Paper SO-7, 20 pp., illus.

Merchandise and methods of selling are changing as retail lumber markets shift from new housing to home improvement and repair.

Row, Clark, and Fasick, Clyde.

1966. WEIGHT-SCALING TABLES BY ELECTRONIC COMPUTER. Forest Prod. J. 16(8): 41-45, illus.

A computer program has been developed for fitting information for single logs or loads to a proven equation form, testing the results, and preparing tables for practical application. It has been tested on a variety of data from across the South.

Row, Clark, Fasick, Clyde, and Guttenberg, Sam.

1965. IMPROVING SAWMILL PROFITS THROUGH OPERATIONS RESEARCH. U. S. Forest Serv. Res. Pap. SO-20, 26 pp., illus.

Batches of logs varying in diameter, grade, density, and position in tree were processed in a modern high-speed mill by several sawing patterns. Time required on each major machine to convert an M b.f. of logs to green lumber was determined. Optimum sawing pattern for each class of logs was determined by linear programming. The analysis evaluated the effects of increasing the log supply, sale of logs for pulpwood, changes in lumber sales policy, purchase of low-grade lumber, adding equipment, and changes in the relative prices of boards and dimension.

Row, Clark, and Guttenberg, Sam.

1962. CHANGING PRICE PATTERNS AFFECT SOUTHERN PINE LUMBER INDUSTRY. Jour. Forestry 60: 120-123, illus.

High-grade boards have been declining in price relative to common grades, while 2-inch dimension has risen. Resulting lower average prices for all lumber have forced modernization of mills and changes in product mix. Associated decreases in value of high-quality logs and stumpage may strongly affect sawtimber management.

Row, Clark, and Guttenberg, Sam.

1966. DETERMINING WEIGHT-VOLUME RELATIONSHIPS FOR SAW LOGS. Forest Prod. J. 16(5): 39-47, illus.

A geometric formula for total log weight and its relationship to common log rules is developed into a general form that provides accurate and consistent estimates of the scale of logs or truckloads.

Siegel, W. C.

1962. FEDERAL LAND BANK TIMBER LOANS IN THE MIDSOUTH. U. S. Forest Serv. South. Forest Expt. Sta. Occas. Paper 194, 15 pp., illus. *Reprinted in part as* WHAT YOU SHOULD KNOW ABOUT LAND BANK LOANS. Forest World 2(1): 31-36. 1963.

Development and operation of the Farm Credit System, with attention to its facilities for making loans to woodland owners in Louisiana, Alabama, and Mississippi.

Siegel, W. C.

1962. FOREST LAND ASSESSMENTS RISING IN LOUISIANA. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 142.

Between 1954 and 1961 the average forest assessment in Louisiana rose nearly 15 percent, from $5.08 to $5.82 an acre.

Siegel, W. C.

1963. The changing southern hardwood lumber industry. South. Lumberman 207(2585): 83-86, illus.

Hardwood lumber output has dropped in all but three southern States in recent years. The southern hardwood region is still the leading producer but has been slowly losing markets to Appalachian, western, and imported hardwoods.

Siegel, W. C.

1964. FOREST TAX LAW AT WORK. Forest Farmer 24(3): 14-16.

Louisiana's Forest Tax Law—essentially a yield-tax statute—has been in force 10 years. More than half the State's woodland is classed as pine, which on the average is assessed higher than cypress or hardwood acreage. Various economic factors cause wide ranges in assessments between parishes.

Siegel, W. C.

1965. TRENDS IN U. S. HARDWOOD EXPORTS. Southern Lumberman 211(2632): 179-183, illus.

Exports are rising, though still far below levels attained before World War II. Fur-

ther expansion is likely, particularly if producers can cut transportation and handling costs and take other steps to meet competition from tropical timber.

SIEGEL, W. C.
1966. FOREST TAX TRENDS IN LOUISIANA. U. S. Forest Serv. Res. Note SO-48, 6 pp., illus.
Average assessments of forest land are declining, severance receipts are rising rapidly. Although reclassification of woodlands under the 1954 Forest Tax Law is virtually complete, widespread discrepancies still exist in assessments.

SIEGEL, W. C.
1967. FEDERAL LAND BANK TIMBER LOANS IN THE UNITED STATES. U. S. Forest Serv. Res. Pap. SO-29, 22 pp., illus.
Loans on woodland collateral are now being written by 10 of the 12 Federal land banks. Most existing loans, however, are in the South and Pacific Northwest. Most individual borrowers are middle-aged or older and have above-average incomes. Loans are also made to corporations.

SIEGEL, W. C.
1967. SOME RECENT TAX DEVELOPMENTS AFFECTING THE TIMBERLAND OWNER. Forest Farmer 26 (12): 6-7, 17-19.
In the last few years, there have been significant court decisions and administrative rulings affecting timber growing and processing. These involve various aspects of the Federal income tax, ad valorem taxes on both timber land and products, and severance taxes.

SIEGEL, W. C.
1968. ANALYSIS OF TIMBER LOANS IN THE FEDERAL LAND BANK SYSTEM. Banking 60(11): 86, 90-91.
Loans on woodland collateral are now being written by 10 of the 12 Federal land banks. Most existing loans, however, are in the South and Pacific Northwest. Most individual borrowers are middle-aged or older and have above-average incomes. Loans are also made to corporations.

SIEGEL, W. C.
1968. THE LEGAL RIGHTS OF LIFE TENANTS TO CUT AND SELL TIMBER. J. Forest. 66: 900-901.
In partial clarification of an issue that has often been the source of confusion, the Georgia Supreme Court held that a life tenant who cut timber under professional guidance did not waste the corpus of the property but rather practiced good forest management.

SIEGEL, W. C.
1970. TIMBER CASUALTY DILEMMA—THE FOREST OR THE TREE? Natur. Resour. Lawyer 3: 555-581.
Discusses implications of two recent court cases and a revenue ruling which deal with a controversial area of the Federal income tax law concerning casualty damage to timber. Is the deductible basis that of the entire stand, or is it limited to the trees actually destroyed?

SIEGEL, W. C.
1970. TIMBER LOAN CLIENTS OF THE NEW ORLEANS FEDERAL LAND BANK—CHARACTERISTICS, ATTITUDES, AND KNOWLEDGE OF CREDIT. USDA Forest Serv. Res. Pap. SO-61, 13 p.
Nearly half of the borrowers used part or all of their loan for forestry purposes and nearly one-fourth planned to expand their timber operations during the next year by using more credit. Forestry-minded respondents were generally those whose tract size and income were above the sample median.

SIEGEL, W. C., AND GUTTENBERG, SAM.
1968. TIMBER LEASES AND LONG-TERM CUTTING CONTRACTS IN THE SOUTH. Forest Ind. 95(4): 62-64.
About 3.7 million acres are under lease, half of them in the East Gulf region. Nearly 2.3 million acres are under long-term cutting contracts, primarily in the Central Gulf and West Gulf regions.

▼SIEGEL, W. C., AND ROW, CLARK.
1965. U. S. HARDWOOD IMPORTS GROW AS WORLD SUPPLIES EXPAND. U. S. Forest Serv. Res. Pap. SO-17, 25 pp., illus.
Once a substantial exporter of hardwood, the U. S. now goes abroad for 60 percent of its hardwood plywood and 5 percent of its lumber. Expanding world timber trade and scarcity of good domestic timber indicate further increases in imports.

SOUTH, D. R., HANSBROUGH, THOMAS, AND BERTRAND, A. L.
1965. FACTORS RELATED TO THE ADOPTION OF WOODLAND MANAGEMENT PRACTICES. Louisiana Agr. Exp. Sta. Bull. 603, 23 pp., illus.
Among various groups, the young, the healthy, the educated, and the holders of large acreages are most receptive. But all groups studied contained some individuals who were interested as well as some who were so habitually resistant to change that they were not persuadable by ordinary means.

▼WHALEY, R. S.
1962. CHIPS VERSUS BOLTS. South. Pulp and Paper Mfr. 25(4): 40, illus.
If present trends continue, chip output will increase during the 1960's, but at a reduced pace. Sawmills will still be the principal suppliers, but an increasing share will come from other wood-products manufacturers.

▼Whaley, R. S.
1963. Loose dollars at pine sawmills. South. Lumberman 206(2565): 35-36, 38, illus.
Of boards being cut by a sample of Alabama sawmills, 40 percent varied excessively in thickness and 21 percent in width. With or without buying new machinery, the mills could have increased profits by applying quality-control techniques.

Whaley, R. S., and GUTTENBERG, SAM.
1962. INFORMAL PARTNERS: WOODLAND OWNERS AND FOREST INDUSTRY. Forest Farmer 22(1): 22-24, illus.
Verbal management agreements between industries

and woodland owners have improved productivity of many small southern woodlands.

▼Whaley, R. S., and Guttenberg, Sam.
1963. Alabama's changing lumber industry. South. Lumberman 206(2571): 28-30, 32, illus.
A survey of 47 mills that cut half the lumber made in the State. The mills have been buying new equipment, diversifying products, raising labor efficiency in logging and milling, and reducing maintenance costs. Most have doubled their output since 1946 but still lack an adequate accounting system, are not using machinery to maximum effectiveness, and have not fully explored marketing and distribution opportunities.

Wheeler, P. R.
1962. SOUTHERN TREES BY THE BILLIONS. Forest Prod. J. 12: 325-327. *Also in* South. Lumberman 206(2568): 81-82, 84.
The 200 million forest acres in the South support 105 billion trees 1 inch and larger in diameter. Some 73 billion are presently or pontentially of sawtimber quality; the rest are culls. Hardwoods outnumber softwoods, but softwood volume is generally increasing and hardwood volume is decreasing.

Yoho, J. G., Dutrow, G. F., and Moak, J. E.
1969. WHAT IT COSTS TO PRACTICE FORESTRY. Forest Farmer 28(11): 20-24, 26, 28, 30-31. *Also in* Forest Farmer 30(7): 42-50. 1971.
Data on 11 forestry practices are tabulated and compared with 1961 data. The information is from a southwide questionnaire survey, and indicates sharp rises in costs.

RESOURCES AND PRODUCTION

ALABAMA

Christopher, J. F.
1962. ALABAMA WOOD-USING PLANTS. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 142.
Of the 672 primary wood-using plants in Alabama during 1961, 555 were sawmills. In 1946, there were 3,030 sawmills.

Judson, G. M.
1965. TREE DIAMETER GROWTH IN ALABAMA. U. S. Forest Serv. Res. Note SO-17, 3 pp., illus. *Also as* DIAMETER GROWTH OF ALABAMA TIMBER. Pulpwood Prod. 13(6): 28.
Loblolly is growing significantly faster than shortleaf and longleaf, but its margin over slash and other pines is small. Yellow-poplar and red oaks, in that order, are the fastest-growing hardwoods; superiority of bottom lands over uplands was marked. Neither pine nor hardwood growth varies much by tree size.

Sternitzke, H. S.
1963. Alabama forests. U. S. Forest Serv. Resource Bul. SO-3, 32 pp., illus. South. Forest Expt. Sta., New Orleans, La.
Alabama has more pine timber than it did a decade ago. Volume in trees at least 5 inches in diameter has risen 28 percent for softwood; hardwood has remained about the same. In trees of sawtimber sizes, softwood rose 30 percent while hardwood dropped 4 percent.

ARKANSAS

Beltz, R. C.
1970. ARKANSAS FOREST INDUSTRIES. USDA Forest Serv. Resour. Bull. SO-21, 28 p.
Forest industries used 390 million cubic feet of Arkansas roundwood during 1968, about 42 percent more than in 1958. Two-thirds of the output was softwood. Saw logs and pulpwood were the leading products. Veneer logs, largely for southern pine plywood, ranked third.

▼Beltz, R. C.
1970. SURVEY DOCUMENTS ADVANCES IN ARKANSAS FOREST INDUSTRY. Forest Ind. 97(10): 83-87.
Output of Arkansas' forest industries increased more than 40 percent between 1958 and 1968 after declining in the previous 10 years. During the 1960's southern pine plywood plants, pulpmills, and large, efficient sawmills were built in the State.

Hedlund, A., and Earles, J. M.
1969. FOREST STATISTICS FOR SOUTHWEST ARKANSAS COUNTIES. USDA Forest Serv. Resource Bull. SO-16, 8 pp.
Commercial forest-land areas and timber inventory, as of 1969.

Hedlund, A., and Earles, J. M.
1969. FOREST STATISTICS FOR THE DELTA AND OUACHITA REGIONS OF ARKANSAS. USDA Forest Serv. Resource Bull. SO-20, 12 pp.
Commercial forest-land areas and timber inventory, as of 1969.

Hedlund, A., and Earles, J. M.
1970. FOREST STATISTICS FOR ARKANSAS COUNTIES. USDA Forest Serv. Resour. Bull. SO-22, 52 p.
Commercial forest-land areas, timber inventory, growth, and cut, as of 1969.

Van Sickle, C. C.
1970. ARKANSAS FOREST RESOURCE PATTERNS. USDA Forest Serv. Resour. Bull. SO-24, 34 p.
In the decade 1959-1969, one-eighth of the forest land in Arkansas was lost to competing uses. Clearing for cropland in the Delta, and for pasture in the Ozarks, had a profound impact on the hardwood resource. Total volume, however, increased slightly between surveys, a 7-

percent loss in hardwoods being offset by a 16-percent gain in softwoods. In both species groups the stand structure shifted to smaller trees.

LOUISIANA

BIESTERFELDT, R. C.
1967. WHERE THE TREES ARE. Forests and People 17(2): 10-13, illus.
Louisiana's forest industries have expanded rapidly in recent years, taking advantage of a surplus of pine growth over cut. The surplus that still exists plus the many opportunities to improve forest productivity makes the State a likely spot for further industrial expansion.

▼Christopher, J. F., and Gunter, E. R.
1963. Louisiana forest industry statistics, 1962. U. S. Forest Serv. Resource Bul. SO-2, 17 pp., illus. South. Forest Expt. Sta., New Orleans, La.
Summarizes 1962 production of industrial roundwood (except pulpwood) by parish, and lists primary wood-using plants in the State.

▼STERNITZKE, H. S.
1962. HOW MUCH TIMBER? WHERE? Forests and People 12(2): 30-31, 45, illus.
A tentative appraisal suggests that both pine and hardwood volumes in Louisiana have increased significantly since the forest survey of 1954.

STERNITZKE, H. S.
1965. LOUISIANA FORESTS. U. S. Forest Serv. Resource Bull. SO-7, 31 pp., illus.
Louisiana has more pines than it did a decade ago. It has fewer hardwoods. Volume in trees at least 5 inches in diameter has risen 43 percent for softwood and declined 20 percent for hardwood. In trees of sawtimber sizes, softwood volume rose 43 percent while hardwood dropped 23 percent.

VAN SICKLE, C. C.
1964. LOUISIANA'S TIMBER HARVEST, 1963. U. S. Forest Serv. Res. Note SO-15, 7 pp., illus.
Of the total of 381 million cubic feet of roundwood, almost half was saw logs and about two-fifths was pulpwood. The report lists primary wood-using plants in the State, except for small sawmills.

▼VAN SICKLE, C. C.
1966. LOUISIANA'S EXPANDING PULP INDUSTRY. Forests and People 16(2): 38-39, illus.
Louisiana's fastest-growing forest industry is the manufacture of wood pulp. Eleven pulpmills are now operating in the State, and several more are in prospect.

MISSISSIPPI

BELTZ, R. C., AND CHRISTOPHER, J. F.
1967. LAND CLEARING IN THE DELTA REGION OF MISSISSIPPI, 1957-1967. U. S. Forest Serv. Res. Note SO-69, 3 pp., illus.
In this region, more than one-fifth of the commercial forest acreage has been cleared in the last decade.

BELTZ, R. C., AND CHRISTOPHER, J. F.
1970. COMPUTER PROGRAM FOR UPDATING TIMBER RESOURCE STATISTICS BY COUNTY, WITH TABLES FOR MISSISSIPPI. USDA Forest Serv. Resour. Bull. SO-23, 22 p.
A computer program is available for updating Forest Survey estimates of timber growth, cut, and inventory volume by species group, for sawtimber and growing stock. Changes in rate of product removal are estimated from changes in State severance tax data. Updated tables are given for Mississippi.

▼BERTELSON, D. F.
1970. TIMBER SALVAGE IN MISSISSIPPI AFTER HURRICANE CAMILLE. Forest Farmer 29(11): 8.
About one-fourth of the timber damaged by Hurricane Camille in Mississippi has been salvaged. The bulk of the salvaged material was pine. Most of the remaining damaged trees are dead and deteriorating rapidly, while trees still alive tend to be too widely scattered for economical operations.

Christopher, J. F.
1963. Mississippi forest industry statistics, 1962. U. S. Forest Serv. Resource Bul. SO-4, 24 pp., illus. South. Forest Expt. Sta., New Orleans, La.
Summarizes 1962 production of industrial roundwood (except pulpwood) by county, and lists primary wood-using plants in the State.

CHRISTOPHER, J. F.
1970. GROWTH COMPONENTS OF MISSISSIPPI FORESTS. USDA Forest Serv. Res. Note SO-100, 4 p.
Net growth of growing stock in Mississippi amounted to 873.5 million cubic feet in 1966. Of this total, 79 percent was survivor growth, 19 percent was ingrowth and growth on ingrowth, and 2 percent was growth on timber cut during the year.

HEDLUND, A.
1969. HURRICANE CAMILLE'S IMPACT ON MISSISSIPPI TIMBER. South. Lumberman 219(2728): 191-192.
Almost 1.2 billion board feet of sawtimber in Mississippi was damaged by Hurricane Camille. Three-fourths of the damage was confined to four counties.

HEDLUND, A., AND EARLES, J. M.
1969. FOREST STATISTICS FOR MISSISSIPPI COUNTIES. USDA Forest Serv. Resource Bull. SO-15, 24 pp.
Commercial forest-land areas, timber inventory, growth, and cut, as of 1967.

▼STERNITZKE, H. S.
1962. MISSISSIPPI FOREST ATLAS. U. S. Forest Serv. South. Forest Expt. Sta., 48 pp., illus.
Generalized maps showing geographic distribution of timber volume, woodland area, and output of timber.

Van Hooser, D. D.
1968. MISSISSIPPI FOREST INDUSTRY. USDA Forest Serv. Resource Bull. SO-12, 25 pp.
In 1966, more than 400 million cubic feet of timber were harvested in Mississippi for pulpwood, saw logs, veneer, poles, piling, and other products. About 305 million cubic feet were processed by forest industries inside the State.

Van Hooser, D. D.
1968. MISSISSIPPI'S FOREST INDUSTRY IS ON UP-SWING. Southern Lumberman 217(2704): 173-174.
Total output is increasing, especially in the lumber, pulp and paper, and veneer industries. Construction of new plants indicates that the trend will continue.

Van Hooser, D. D.
1970. LOBLOLLY PINE GROWTH ON FOREST SURVEY PLOTS IN MISSISSIPPI. Forest Sci. 16: 342-346.
Between 1957 and 1967, volume and basal area growth were related to initial basal area and diameter of loblolly pines, and to initial cubic volume of all trees. Regressions accounted for 30 percent of the variation in cubic volume growth and 64 percent of the variation in basal area growth.

Van Hooser, D. D., and Hedlund, A.
1969. TIMBER DAMAGED BY HURRICANE CAMILLE IN MISSISSIPPI. USDA Forest Serv. Res. Note SO-96, 5 pp.
Hurricane Camille damaged the equivalent of 4 million standard cords of growing stock in 15 southern Mississippi counties. This was equal to 1.7 years of growth or three times the annual harvest for the region.

▼Van Sickle, C. C.
1969. HURRICANE CAMILLE CAUSES EXTENSIVE TIMBER DAMAGE. Forest Farmer 29(1): 9, 16-17.
The hurricane damaged timber heavily in six Mississippi counties, and caused some loss in 10 other counties and two Louisiana parishes. A timber cruise is under way to appraise the loss.

▼Van Sickle, C. C.
1970. MISSISSIPPI FORESTS IN PROFILE. Forest Farmer 29(4): 12, 16-18.
The latest forest survey of the State reveals important gains, particularly in pine timber volume, and massive industrial developments.

▼Van Sickle, C. C., and Hedlund, A.
1969. TIMBER LOSSES FROM HURRICANE CAMILLE. Forest Farmer 29(3): 6-7.
Damage to Mississippi timber amounted to more than 290 million cubic feet. Most of the volume is physically salvable for pulpwood.

Van Sickle, C. C., and Van Hooser, D. D.
1969. FOREST RESOURCES OF MISSISSIPPI. USDA Forest Serv. Resource Bull. SO-17, 34 pp.
Mississippi forests contain 15 billion cubic feet of timber growing on 17 million acres of commercial forest land. Pine volume is rising, hardwood volume is static. Growth exceeds cut but is well below attainable levels.

OKLAHOMA

Sternitzke, H. S., and Van Sickle, C. C.
1968. EAST OKLAHOMA FORESTS. USDA Forest Serv. Resource Bull. SO-14, 32 pp.
Indications are that softwood will increase; hardwood will remain at its present level.

▼Sternitzke, H. S., and Van Sickle, C. C.
1969. EAST OKLAHOMA TIMBER TRENDS. Forest Farmer 28(4): 16-17.
East Oklahoma has considerably more pine timber than it did a decade ago, but hardwood volume has declined slightly.

Van Sickle, C. C.
1967. EAST OKLAHOMA'S TIMBER HARVEST, 1965. U. S. Forest Serv. Res. Note SO-57, 6 pp., illus.
Pine saw logs and pine posts make up half of the total roundwood harvest.

TENNESSEE

Christopher, J. F.
1962. TENNESSEE WOOD-USING PLANTS. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 138.
Of 1,286 primary wood-using plants in the State in 1960, 1,135 were sawmills. In 1946 there were 2,789 sawmills.

Sternitzke, H. S.
1962. TENNESSEE FORESTS. U. S. Forest Serv. South. Forest Expt. Sta. Forest Survey Release 86, 29 pp., illus.
Tennessee has more timber than it did a decade ago. Volume in trees at least 5 inches in diameter has risen 33 percent for softwoods and 22 percent for hardwoods. For trees of sawtimber sizes, the gains have been 37 percent in softwoods, 18 percent in hardwoods.

Sternitzke, H. S.
1962. TENNESSEE TIMBER TRENDS. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 142.
See entry above.

Van Sickle, C. C.
1967. FOREST INDUSTRIES IN APPALACHIA COUNTIES OF TENNESSEE. U. S. Forest Serv. Resource Bull. SO-8, 21 pp., illus.
In 1965 the forests of Tennessee's Appalachia counties supplied more than 70 million cubic feet of roundwood to forest industries. An additional 20 million cubic feet was used for domestic purposes. The report lists all primary wood-using plants in the region and gives product output and plant residue information by county.

TEXAS

▼Fassnacht, D. L.
1967. EAST TEXAS FOREST RESOURCES—TODAY AND TOMORROW. East Tex. 42(3): 8, 22.

At present, Texas forests are growing 44 cubic feet per acre. This rate must be doubled if the region is to continue to attract forest industry—and doubling it will require greatly improved management of small holdings.

▼ JUDSON, G. M.
1964. FORESTRY SURVEY IS PLANNED FOR 1964. Tex. Forests and Texans 5(3): 11.
The third forest survey of Texas will begin in September.

▼STERNITZKE, H. S.
1966. TIMBER TRENDS IN THE UNITED STATES AND THE STATUS OF THE TEXAS FOREST SURVEY. Tex. Forests and Texans 7(2): 1, 4.
The South appears destined to supply an increasing portion of the Nation's timber markets. As a leading timber-producing region, east Texas will share in the expansion of southern forest industries.

STERNITZKE, H. S.
1967. EAST TEXAS PINEYWOODS. U. S. Forest Serv. Resource Bull. SO-10, 30 pp., illus.
East Texas has considerably more pine timber than it did a decade ago, but hardwood volume has declined.

STERNITZKE, H. S.
1967. EAST TEXAS POST OAK REGION. U. S. Forest Serv. Resource Bull. SO-11, 8 pp., illus.
The 26 counties that make up the post oak region of east Texas encompass 3 million acres of forest land. Of the total acreage, about 1.5 million is classed as commercial forest land. The volume of growing stock on the commercial forest area is 521 million cubic feet.

▼STERNITZKE, H. S.
1968. EAST TEXAS PINEY WOODS—A NEW LOOK. Forest Farmer 27(5): 6-8, 16, 18.
East Texas has considerably more pine timber than it did a decade ago, but hardwood volume has declined.

VAN SICKLE, C. C.
1966. EAST TEXAS' TIMBER HARVEST, 1964. U. S. Forest Serv. Res. Note SO-36, 11 pp., illus.
Of the total 264 million cubic feet of roundwood harvested, more than half was saw logs, and about one-third was pulpwood. This report lists all primary wood-using plants in east Texas.

REGIONAL

BELTZ, R. C.
1968. 1967 PULPWOOD PRICES IN THE MIDSOUTH. Southern Pulp and Pap. Manufacturer 31(8): 20.
The average for hardwood bolts was $15.19 per cord, up 15 cents from 1966. Pine bolts sold for $17.16 per cord, an increase of 29 cents.

BELTZ, R. C.
1969. MID-SOUTH PULPWOOD PRICES, 1968. South. Pulp and Pap. Manufacturer 32: 64.
Prices rose to record highs in 1968. Roundwood averaged $17.75 per cord for pine and $15.86 for hardwoods. Chipped residues were $6.86 per ton for softwoods and $6.09 for hardwoods.

BELTZ, R. C.
1969. SOUTHERN PULPWOOD PRODUCTION, 1968. USDA Forest Serv. Resource Bull. SO-18, 21 pp.
Production in 1968 reached an all-time high of 37,075,355 cords. Gains were prevalent throughout the South in both roundwood and residues. Daily pulpmill capacity expanded 6,613 tons during the year.

BELTZ, R. C.
1970. MIDSOUTH PULPWOOD PRICES, 1969. S. Pulp & Pap. Mfr. 33: 201.
Prices rose to an average of $18.54 per cord for pine bolts and $16.87 for hardwood. Chipped residues were up to $7.45 per ton for pine and $6.62 for hardwood. Prices east of the Mississippi have traditionally been higher than west of the river, but in recent years the differential has been declining.

BELTZ, R. C., AND CHRISTOPHER, J. F.
1968. POLE AND PILING PRODUCTION IN THE MIDSOUTH. USDA Forest Serv. Resource Bull. SO-13, 17 pp.
In 1964, nearly 53 million cubic feet of poles and piling were produced in the Midsouth. Virtually all the volume was southern pine.

▼BELTZ, R. C., AND CHRISTOPHER, J. F.
1968. SURVEY SHOWS AMPLE SUPPLY OF SOUTHERN PINE POLES AND PILES. Wood Preserv. 46(10): 20-23.
The Midsouth, which produces more than half the poles and piling treated in the Nation, has a good supply of timber at stumpage prices that encourage logging.

CHRISTOPHER, J. F.
1962. CHARCOAL INDUSTRY GROWS IN MIDSOUTH. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 139.
Total production in 1961 was 95,000 tons, a gain of 28 percent since 1956.

CHRISTOPHER, J. F.
1962. MIDSOUTH'S RISING PULPWOOD VALUES. South. Pulp and Paper Mfr. 25(7): 92, illus.
Prices for pine bolts increased from $12.16 per cord in 1950 to $15.87 in 1961; hardwood bolts rose $2.39 per cord during the same period. Green chipped residues have remained stable since 1957.

CHRISTOPHER, J. F.
1962. PULPWOOD CHIPPING INSTALLATIONS IN THE MIDSOUTH. U. S. Forest Serv. South. Forest Expt. Sta. Forest Survey Release 87, 14 pp., illus.
At least 372 Midsouth firms are currently producing chips for sale to pulp mills. Sawmill residues are the main source of raw material.

CHRISTOPHER, J. F.
1962. PULPWOOD CUT TOPS 24 MILLION CORDS. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 140.
See Robinson and Nichols, 1962.

Christopher, J. F.
1963. How the South's pulpwood moved in '62. Pulpwood Prod. 11(12): 16, illus.
More than one-fourth of the South's pulpwood moves interstate. Florida is the principal importing State, Georgia leads in exports. The present movement pattern is expected to remain stable until considerable change occurs in pulping capacity.

▼Christopher, J. F.
1963. Outdoor living culture means money in bank for forest landowners. Forest World 1(4): 40-41.
To supply backyard barbecue cooks, Midsouth charcoal manufacturers have been expanding their production, and thus somewhat increasing the market for low-quality hardwood trees, especially oak.

Christopher, J. F.
1963. Pulpwood price trends in the Mid-south, 1946-1962. South. Pulp and Paper Mfr. 26(8): 38, illus.
Average prices for pine bolts rose from 1946 to 1956 and then remained stable, though with some differences among delivery points. Changes in annual output accounted for most of the variation in prices. Hardwood bolts remained steady after 1950, and chipped pine and hardwood residues changed little after 1957, even though volumes of these products increased greatly.

Christopher, J. F.
1964. MID-SOUTH VENEER LOGS. South. Lumberman 209(2609): 139-140, illus.
The hardwood veneer industry is dependent upon large, high-quality timber. Soft-textured species make up most of the output.

Christopher, J. F.
1964. PULPWOOD PRICE TRENDS IN THE MIDSOUTH, 1937-1963. U. S. Forest Serv. Res. Note SO-9, 2 pp. *Also in* South. Pulp and Paper Mfr. 27(9): 106.
Prices have been largely stable since 1957. In 1963 they averaged $15.77 per cord for pine bolts, $13.10 for hardwood bolts, and $6.26 per ton for green pine chips.

▼Christopher, J. F.
1965. PULPWOOD PRICES IN THE MIDSOUTH, 1957-1964. Southern Pulp and Pap. Manufacturer 28(7): 58.
Pine bolts averaged $15.92 per cord in 1964, higher than in any year except 1960. Hardwood bolts brought $13.17, a trifle above their recent average. Prices of green chips have been stable since 1957, at about $6.21 per ton for pine and $4.60 for hardwood.

Christopher, J. F.
1965. SOUTHERN PULPWOOD PRODUCTION, 1964. U. S. Forest Serv. Resource Bull. SO-6, 22 pp., illus.
The total was 28,826,000 cords, a gain of 2,235,000 cords over 1963. Sixteen percent was in chipped residues, 65 percent in pine bolts, 11 percent in bolts of soft-textured hardwoods, and 8 percent in bolts of firm-textured hardwoods.

Christopher, J. F.
1967. 1966 PULPWOOD PRICES IN THE MIDSOUTH. Southern Pulp & Pap. Manufacturer 30(10): 42, illus.
The average for hardwood bolts was $15.04 a cord—$1.25 more than in 1965. Pine bolts sold for $16.87, a new high. Prices for green chipped residues made modest gains.

▼Christopher, J. F.
1967. PULPWOOD PRICES IN THE MID-SOUTH, 1957-1965. Southern Pulp and Pap. Manufacturer 30(2): 28.
In 1965 prices for delivered pulpwood were the highest on record, averaging $16.30 per cord for pine and $13.79 for hardwood. Prices for green chips were up 12 percent over 1964.

▼Christopher, J. F.
1968. THE NATION'S CHANGING POLE RESOURCES. Proc., Wood Pole Inst., pp. 49-55. Fort Collins, Colo.
Since 1950 the U. S. has produced an average of 6 million poles annually. About 1 percent of the Nation's softwood harvest is converted to poles. Outlook is good, since the number of suitable trees is ample and stumpage prices encourage logging. The South will remain the dominant pole-producing region.

Christopher, J. F.
1969. POLE SUPPLY OUTLOOK. Forest Farmer 28(4): 6-7, 17.
National demand for poles over the next few decades is projected at 7 to 8 million annually. The South will continue to supply more than three-fourths of the Nation's requirements.

Christopher, J. F.
1970. SOUTH'S 1968 PULPWOOD OUTPUT AND SUPPLY. APA Quart. Pap. 69-16, p. 14-15.
Of the expansion in southern pulping capacity during the past decade, 60 percent occurred in the Midsouth. The rise in Midsouth pulpwood output matched the gain in capacity. This region's pine forests can sustain continued industrial expansion, but the outlook for hardwoods is less optimistic.

Christopher, J. F., and Nelson, M. E.
1963. Southern pulpwood production, 1962. U. S. Forest Serv. Resource Bul. SO-1, 24 pp., illus. South. Forest Expt. Sta., New Orleans, La.
Of the all-time high of 25,586,300 cords, 15 percent was in chipped residues, 65 percent in pine bolts, 14 percent in bolts of soft-textured hardwood species, and 6 percent in bolts of firm-textured hardwoods.

Christopher, J. F., and Sternitzke, H. S.
1964. MIDSOUTH VENEER INDUSTRY. U. S. Forest Serv. Resource Bul. SO-5, 12 pp., illus.
Summarizes 1963 veneer-log production and consumption. Includes directory of all veneer plants and complete list of southern pine plywood mills.

Cost, N. D.
1968. SOUTHERN PULPWOOD PRODUCTION, 1967. USDA Forest Serv. Resource Bull. SE-11, 23 pp. Southeast. Forest Exp. Sta., Asheville, N. C.
Pulpwood production in the South leveled off slightly in 1967 but still established another record high of 33,651,100 cords—63 percent of the Nation's total. Significant gains were made in the use of residues, whereas roundwood production decreased slightly for the first time in 10 years.

▼Fassnacht, D. L.
1963. Our coming southern pine plywood industry. Soc. Amer. Foresters Gulf States Sect. Newsletter 5(4): 36-40.
Developments to date, including formulation of a tentative commercial standard.

Guttenberg, Sam.
1963. Changing perspectives—in the forest resource. The Unit, News Letter 98, pp. 23-25, illus.
" . . . The record of the past few decades . . . tells us of the need to grow quality wood for all industrial uses . . . . And it shows that loggers and processors must continuously strive to improve their operations before they are forced to . . . . "

Guttenberg, Sam.
1965. PRESENT AND FUTURE STATUS OF THE MIDSOUTH'S HARDWOOD. Amer. Pulpwood Assoc. Tech. Pap., April 1965, pp. 23-25, illus. Pap. 64-76:(7.2).
The historic decline of Midsouth hardwood seems to have been checked. Continuing losses of land and timber in the Delta are being offset by gains elsewhere. Sustained and heavy demand by the pulp and other industries has caused gum supplies to decline. An eightfold increase in demand by the year 2000 is possible with an improved resource. Management needs to be directed to the gums, cottonwood, willow, yellow-poplar, and the bottom-land oaks, because these species can grow fiber and other products rapidly.

Guttenberg, Sam.
1965. THE SOUTH'S CHANGING FORESTS. Southern Lumberman 210(2617): 14-15, 17-18, illus.
Between 1953 and 1963, the South's total forest acreage expanded by 3 percent. Softwoods increased in both volume and quality, hardwoods gained in volume but declined seriously in quality. Since 1957 more pine has been going into pulpwood than into saw logs; in hardwoods, saw logs still lead but pulpwood is gaining rapidly. Though use of residues for pulp chips continues to rise, current mill expansion will boost demand for roundwood. On the whole, future markets are promising, if tree growers will strive for quality as well as volume.

Guttenberg, Sam.
1967. HOW INCREASED PULPWOOD DEMAND CAN IMPROVE THE AREA I TIMBER SUPPLY. Area I Spring Meeting Southern Pulpwood Conserv. Assoc. Proc., 4 pp.
The West Gulf has outstanding advantages in advanced management programs, growing stock, stands that can sustain highly mechanized logging, and opportunities for complete timber utilization.

Hedlund, Arnold, and Janssen, Paul.
1963. Major forest types in the South. U. S. Forest Serv. South. and Southeast. Forest Expt. Stas., 1 p., illus.
Map, in color, at scale of 40 miles to the inch.

Hedlund, A., and Knight, H. A.
1969. HARDWOOD DISTRIBUTION MAPS FOR THE SOUTH. USDA Forest Serv. Resource Bull. SO-19, 13 pp.
Volumetric distribution, in the form of maps, of 12 hardwood species and groups of species.

Knight, H. A., and Nichols, A. C.
1964. SOUTHERN PULPWOOD PRODUCTION, 1963. U. S. Forest Serv. Resource Bul. SE-3, 26 pp., illus.
Of a new high of 26,591,000 cords, 16 percent was in chipped residues, 13 percent in bolts of soft-textured hardwoods, and 6 percent in bolts of firm-textured hardwoods.

Robinson, V. L., and Nichols, Agnes C.
1962. SOUTHERN PULPWOOD PRODUCTION, 1961. U. S. Forest Serv. Southeast. Forest Expt. Sta. Forest Survey Release 59, 26 pp., illus.
Of the record total of 24.2 million cords, 4.9 million was hardwood and 3.2 was chipped mill residues.

▼Sternitzke, H. S.
1962. THE HARDWOODS OF MID-AMERICA. Forest Farmer 21(8): 10-11, 26, illus.
Efficiently managed, the hardwood lands of the South could provide the raw-material base for an annual output of products valued at $10 billion.

Sternitzke, H. S.
1970. MID-SOUTH VENEER PRODUCTION: TRENDS AND OUTLOOK. S. Lumberman 221(2752): 149-151.
Hardwood veneer logs are in short supply, but the pine resource is gaining in both size and quantity; by the middle 1970's the Midsouth should be producing at least a fourth of the Nation's projected cut of softwood veneer logs.

Sternitzke, H. S., and Christopher, J. F.
1962. TRENDS IN SOUTHERN HARDWOOD PRODUCTION. Pulpwood Prod. 10(3): 24, illus.
Projection of 1950-60 trends in southern hardwoods indicates that the output of pulpwood will soon exceed that of saw logs.

Sternitzke, H. S., and Christopher, J. F.
1970. LAND CLEARING IN THE LOWER MISSISSIPPI VALLEY. Southeast. Geogr. 10(1): 63-66.
The forests of the lower Mississippi Valley, or Delta, are the most productive hardwood lands of any size in the nation, but they are being cleared rapidly. In the middle 1930's the Forest Survey classified 11.8 million Delta acres as forest; today the total is 8 million and further declines are in prospect.

Sternitzke, H. S., and Christopher, J. F.
1970. TIMBER SUPPLY TRENDS IN THE SOUTH. Forest Farmer 29(8): 8-9, 17.
The sizable expansion of southern timber industries during the 1960's is not inducing resource depletion. Pine growing-stock supplies are still gaining, and would sustain further industrial development. In hardwoods, current prospects for expansion of industries dependent upon large, high-quality timber are dim.

Sternitzke, H. S., and Nelson, T. C.
1970. THE SOUTHERN PINES OF THE UNITED STATES. Econ. Bot. 24: 142-150.
Maps and a table describe the commercial range, economic volume, and geographic density of the 10 southern pines.

Van Hooser, D. D., and Christopher, J. F.
1967. SOUTHERN PULPWOOD PRODUCTION, 1966. U. S. Forest Serv. Resource Bull. SO-9, 23 pp., illus.
The total was 33,061,000 cords, a gain of 2,270,000 cords over 1965. Seventeen percent was in chipped residues, 63 percent in pine bolts, 15 percent in bolts of oak and gum, and 5 percent in bolts of other hardwoods.

Van Sickle, C. C.
1969. FOREST RESOURCE AND INDUSTRY TRENDS IN THE MID-SOUTH. South. Lumberman 219(2728): 163-165.
Though regional pulping capacity has been expanding rapidly and a new pine plywood industry has arisen, the softwood inventory is still increasing. Further industrial development is therefore possible. In hardwoods, however, total volume is changing little and high-quality trees are difficult to find.

Van Sickle, C. C.
1969. TIMBER RESOURCES AND INDUSTRIES OF THE SOUTH-CENTRAL UNITED STATES. J. Forest. 67: 860-864.
Between 1963 and 1968, forest industry in this region expanded and pine volume increased. Hardwood volume increased slightly, but quality continued to decline.

Van Sickle, C. C., and Sternitzke, H. S.
1964. OUTPUT OF PULPING HARDWOOD RISING RAPIDLY. South. Pulp and Paper Mfr. 27(10): 72, illus.
During the next half-dozen years, cubic volume of hardwoods cut for pulpwood will exceed that harvested for saw logs.

Welch, R. L.
1966. SOUTHERN PULPWOOD PRODUCTION, 1965. U. S. Forest Serv. Resource Bull. SE-7, 23 pp., illus.
The total was 30,790,800 cords, a gain of 1,965,000 cords over 1964. Seventeen percent was in chipped residues, 63 percent in pine bolts, 11 percent in bolts of soft-textured hardwoods, and 9 percent in bolts of firm-textured hardwoods.

Welch, R. L.
1970. SOUTHERN PULPWOOD PRODUCTION, 1969. USDA Forest Serv. Resour. Bull. SE-18, 20 p. Southeast. Forest Exp. Sta., Asheville, N. C.
Production climbed to 40,869,000 cords, an increase of 3,794,000 cords over 1968 and the greatest annual increment ever recorded in the region. Daily pulping capacity of the 105 southern pulpmills was 80,980 tons.

HARVEST AND MANUFACTURE

▼Arganbright, D. G., Bensend, D. W., and Manwiller, F. G.
1970. INFLUENCE OF GELATINOUS FIBERS ON THE SHRINKAGE OF SILVER MAPLE. Wood Sci. 3: 83-89.
Degree of lean significantly influenced the longitudinal and transverse shrinkage of wood from three soft maple trees; the effect appeared due to differences in cell wall layer thickness and fibril angle.

▼Barnes, H. M., Choong, E. T., and McIlhenny, R. C.
1969. AN EVALUATION OF SEVERAL VAPOR PHASE CHEMICAL TREATMENTS FOR DIMENSIONAL STABILIZATION OF WOOD. Forest Prod. J. 19(3): 35-39.
Ethylene oxide gave good results. Oscillating pressure was better than constant pressure. High anti-swell values were obtained with low polymer loading.

▼Blomquist, R. F.
1969. GLUING OF SOUTHERN PINE. Forest Prod. J. 19(4): 36-44.
A review, with special attention to developments that led to the establishment and growth of the southern pine plywood industry.

Carpenter, B. E., Jr.
1962. LOGS SHRINK IN FALL STORAGE. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 139.
During 5 weeks of fall storage, freshly cut oak and sweetgum logs shrank appreciably in scaling diameter.

Carpenter, B. E., Jr.
1962. SOUTHERN HARDWOODS MAKE GOOD FENCE POSTS. USDA Forest Serv. South. Forest Exp. Stn. South. For. Notes 140. *Also as* HARDWOODS FOR FENCE POSTS. Forest World 2(2): 12.
See Carpenter and Bouler below.

▼Carpenter, B. E., Jr.
1964. SOUTHERN HARDWOOD LOG STORAGE—PRACTICES, PROBLEMS, AND BENEFITS. Ala. Forest Prod. 7(10): 18-22, illus.
While some logs are stored in ponds

and many are cold-decked, there is increasing interest in protecting piled logs by steady or intermittent water sprays. Chemicals are not widely used.

▼Carpenter, B. E., Jr., and Bouler, T. P.
1962. HARDWOOD FENCE POSTS GIVE GOOD SERVICE IN LONG RANGE DELTA TEST. Miss. Farm Res. 25(11): 6. *Also as* Miss. Agr. Expt. Sta. Inform. Sheet 782, 2 pp.
Sapwood posts, treated by the hot-and-cold-bath method with creosote or pentachlorophenol, have given excellent service in Mississippi.

Carpenter, B. E., Jr., and Hopkins, W. C.
1966. SPECIFIC GRAVITY VALUES OF SWEETGUM TOPWOOD AND BOLEWOOD. Forest Prod. J. 16(7): 30.
Values for three stands in the Mississippi Delta averaged 0.510, with no significant difference between tops and boles.

▼Chappell, T. W.
1968. HARVESTING PINE CONES WITH MECHANICAL TREE SHAKERS. Proc., Forest Eng. Conf. ASAE Pub. PROC-368, pp. 65, 68.
An average of 77 percent of the cones on 213 slash pines were removed by shaking. Tree height and crown length affected cone removal.

Chappell, T. W.
1969. PRODUCTION RATES FOR THE BUSCHCOMBINE IN A SOUTHERN PINE STAND. Pulpwood Prod. 17 (11): 20, 22.
Productivity of this pulpwood harvesting machine improved as tree diameter increased.

▼Chappell, T. W., and Hamann, D. D.
1968. POISSON'S RATIO AND YOUNG'S MODULUS FOR APPLE FLESH UNDER COMPRESSIVE LOADING. Amer. Soc. Agr. Eng. Trans. 11: 608-610, 612.
Compression creep tests at four stress levels were performed on Winesap, Golden Delicious, and Red Delicious apple flesh. An empirical equation with stress-dependent coefficients was developed to represent a time-dependent Poisson's ratio. A Burger's four-element model was used to represent the initial Young's modulus.

▼Chappell, T. W., and Richardson, B. Y.
1970. SOIL TRAFFICABILITY AND ITS APPLICATION TO LOGGING. Forest Prod. J. 20(2): 51-54.
A system developed by the Waterways Experiment Station of the U. S. Army Engineers can be used to relate performance of rubber-tired skidders to soil conditions.

▼Choong, E. T.
1969. MOISTURE AND THE WOOD OF THE SOUTHERN PINES. Forest Prod. J. 19(2): 30-36.
"The moisture content in standing trees is influenced by lateral and vertical position within the tree, age of the tree, site quality, geographical location, and season of year . . . . Volumetric shrinkage is not only dependent on specific gravity and fiber saturation point but also on content of extractives."

▼Choong, E. T., and Barnes, H. M.
1969. EFFECT OF SEVERAL WOOD FACTORS ON DIMENSIONAL STABILIZATION OF SOUTHERN PINES. Forest Prod. J. 19(6): 55-60.
Polyethylene glycol gave the highest anti-swell efficiency value. Better stabilization was obtained with low-density corewood than with high-density maturewood. Stability was best when wood was preswollen and the chemical impregnated by diffusion.

▼Christopher, J. F., and Wahlgren, H. E.
1964. ESTIMATING SPECIFIC GRAVITY OF SOUTH ARKANSAS PINE. U. S. Forest Serv. Res. Paper SO-14, 10 pp., illus.
Specific gravity of the merchantable portion of the bole of loblolly and shortleaf pines can be estimated from increment cores taken at breast height. At slight additional cost, the precision of the estimates can be substantially increased by including such data as age, diameter, and merchantable length.

▼Côté, W. A., and Day, A. C.
1969. WOOD ULTRASTRUCTURE OF THE SOUTHERN YELLOW PINES. State Univ. Coll. Forest., Syracuse Univ. Tech. Pub. 95, 70 pp.
About 140 electromicrographs. The research failed to uncover ultrastructural features that would distinguish the wood of one species from that of another.

▼Darwin, W. N., Jr.
1965. SKIDDING COEFFICIENTS ON AN ALLUVIAL SOIL. Forest Prod. J. 15: 302, illus. *Also as* SOIL WETNESS INFLUENCES LOG SKIDDING. Ala. Forest Prod. 8(10): 90, illus.
Hardwood logs skidded less easily when Sharkey clay was at field maximum than when it had dried. Species, diameter, specific gravity, and weight of the logs did not influence coefficients.

▼Duffy, I. T.
1970. SEARCH FOR A DETERRENT TO WOODPECKER ATTACKS ON UTILITY POLES. Forest Farmer 29 (6): 10-11, 18.
Woodpecker nests weaken utility poles, and creosote fumes kill eggs laid there. Method for keeping woodpeckers out of poles are being tested.

▼Durso, D. F.
1969. DISSOLVING PULP FROM SOUTHERN PINE WOOD. Forest Prod. J. 19(8): 49-56.
A review of processes for manufacturing the pulp and preparing derivatives, and a general history of dissolving pulp.

▼Erickson, H. D.
1970. PERMEABILITY OF SOUTHERN PINE WOOD—A REVIEW. Wood Sci. 2: 149-158.
Summary of published information, with some comparisons with other species.

▼ Fassnacht, D. L.
1964. DEVELOPMENTS IN SOUTHERN PINE PLYWOOD.

Ala. Forest Prod. 7(5): 7, 11.
See entry below.

▼FASSNACHT, D. L.
1964. THE STORY BEHIND THE NEW SOUTHERN PINE PLYWOOD INDUSTRY. Forest Prod. Jour. 14: 21-22, illus.
Plants are under construction and a tentative commercial standard has been accepted by prospective manufacturers, most of the western industry, many users and distributors, and the FHA.

FASSNACHT, D. L.
1965. SOUTHERN PINE PLYWOOD. Southern Lumberman 210(2616): 15-16, illus.
After the first year of industrial operation, 3 mills were in production, 10 were building, and 7 more were planned. Competition for wood—and ultimately landownership patterns—will govern extent of development.

▼FASSNACHT, D. L.
1968. CREATING A BIG INDUSTRY TO SAVE SMALL TOWNS. *In* Science for better living, pp. 179-182. USDA Yearbook 1968.
The 5-year-old southern pine plywood industry is renewing the prosperity of 33 southern towns.

GUTTENBERG, SAM.
1967. VENEER YIELDS FROM SOUTHERN PINE BOLTS. Forest Prod. J. 17(12): 30-32, illus.
Volume and grade of outturn vary with diameter, grade and grain density of bolts. Hourly lathe capacity varied from 2 to 12 M bd. ft. as bolt size increased from 8 to 24 inches.

▼HARRINGTON, T. A.
1969. PRODUCTION OF OLEORESIN FROM SOUTHERN PINE TREES. Forest Prod. J. 19(6): 31-36.
A review of developments in techniques, methods, and equipment.

HARRINGTON, T. A., AND TAYLOR, H.
1969. MECHANIZED SYSTEM FOR HARVESTING PINE GUM. Forest Farmer 28(4): 8-10, 18-19.
A proposed new system has four basic components: a paste formulation to stimulate gum flow, a disposable paper gum cup, powered handtools, and a prime mover to carry men and equipment from tree to tree.

▼HOPKINS, W. C., CHOONG, E. T., AND FOGG, P. J.
1969. KILN-DRYING DIFFERENT THICKNESSES OF SOUTHERN PINE LUMBER. La. State Univ. Agr. Exp. Sta. Bull. 636, 21 pp.
On the same kiln schedule, ¾ lumber dried faster than 4/4, and without more defect. But when 6/4 lumber was dried on an 8/4 schedule, the more rapid drying was accompanied by an increase in warp, casehardening, and checking.

HOWARD, E. T., AND MANWILLER, F. G.
1969. ANATOMICAL CHARACTERISTICS OF SOUTHERN PINE STEMWOOD. Wood Sci. 2: 77-86.
Detailed description, with many illustrations. Extensive observations revealed no anatomical differences that would separate the wood of individual species of the 10 southern pines.

HSE, C. Y.
1968. GLUABILITY OF SOUTHERN PINE EARLYWOOD AND LATEWOOD. Forest Prod. J. 18(12): 32-36.
Glue bond quality, as tested wet and dry in tension, was best with earlywood to earlywood and poorest with latewood to latewood. At any given percentage of wood failure, the bond strength was proportional to wood density.

▼HUDSON, F. M., AND RAINER, R. K.
1970. FOREST ROAD STRUCTURE RESEARCH. Ala. Forest Prod. 13(7): 63, 65, 67.
The USDA Forest Service and the Civil Engineering Department of Auburn University are cooperating to assess the feasibility of research to improve forest roads.

▼HUDSON, M. S.
1969. CHEMICAL DRYING OF SOUTHERN PINE WOOD. Forest Prod. J. 19(3): 21-24.
Reviews past practices, describes several processes in current use.

▼IFJU, G.
1969. WITHIN-GROWTH-RING VARIATION IN SOME PHYSICAL PROPERTIES OF SOUTHERN PINE WOOD. Wood Sci. 2: 11-19.
Strength properties and specific gravity were correlated. Work to maximum load increased from earlywood to latewood, but total energy remained constant across increments.

▼KLEPPE, P. J.
1970. A REVIEW: THE PROCESS OF, AND PRODUCTS FROM, KRAFT PULPING OF SOUTHERN PINE. Forest Prod. J. 20(5): 50-59.
Specific gravity seems to be the best single property for characterizing pulpwood quality.

KOCH, PETER.
1964. BEAMS FROM BOLTWOOD: A FEASIBILITY STUDY. Forest Prod. Jour. 14: 497-500, illus.
A plant to manufacture beams plus plup chips can be built for about $1,300,000.

KOCH, PETER.
1964. SQUARE CANTS FROM ROUND BOLTS WITHOUT SLABS OR SAWDUST. Forest Prod. Jour. 14: 332-336, illus.
First of four articles on studies of technical and economic feasibility of manufacturing long, laminated structural beams out of thick veneers sliced from cants cut from southern pine boltwood. This article describes tests of three unconventional headrigs. Each can cut, in a single 12-second operation, an accurately sized, heart-center S4S cant. Wood outside the

cant is cut directly into pulp chips, without sawdust.

▼KOCH, PETER.

1964. STRENGTH OF BEAMS WITH LAMINAE LOCATED ACCORDING TO STIFFNESS. Forest Prod. Jour. 14: 456-460, illus.

Beams of uniform high strength were obtained by locating the stiffest laminae on the top and bottom of each beam, and the least stiff in the center.

KOCH, PETER.

1964. TECHNIQUES FOR DRYING THICK SOUTHERN PINE VENEER. Forest Prod. Jour. 14: 382-386, illus.

Veneers 7/16-inch thick were successfully dried by jet dryer, conventional dryer, and hot press. Resin exudation was heavy, but no treatment significantly affected stiffness or strength of individual veneers.

▼ KOCH, PETER.

1964. USING LOW-GRADE HARDWOOD: A PROPOSED INTEGRATED PLANT DESIGN. Mich. State Univ. Ext. Bul. 460, 28 pp., illus.

The plant, designed for the lower peninsula of Michigan, would manufacture pallets, skids, grain doors, and similar products; the waste would be briquetted for fireplace use.

▼KOCH, PETER.

1965. MAXIMIZING WET SHEAR STRENGTH. Forest Prod. J. 15: 463-465, illus.

Loblolly pine plywood of maximum wet shear strength was obtained by: (1) using veneer of high specific gravity; (2) peeling veneer hot and tight; (3) peeling in such a way that lathe checks were frequent; (4) peeling in such a way that lathe checks were shallow; (5) using veneer cut from slow-grown trees; (6) using either no secondary extender (best) or wheat flour only; (7) increasing gluespread; and (8) minimizing assembly time.

▼KOCH, PETER.

1965. MAXIMIZING WOOD FAILURE. Forest Prod. J. 15: 355-361, illus.

Wood failure (an indicator of durability), as determined on thoroughly soaked shear specimens of loblolly pine plywood, was maximized at 99 percent by: (1) using veneer of low specific gravity cut from slow-growing trees; (2) peeling the veneer loose (as contrasted to tight); (3) increasing the percent of phenol-formaldehyde resin solids in the wet gluemix; (4) using only wheat flour as a secondary extender (as contrasted with no secondary extender or with blood-plus-wheat flour extender); and (5) increasing the amount of gluespread on the core.

▼KOCH, PETER.

1965. MINIMIZING FACE CHECKING. Forest Prod. J. 15: 495-499, illus.

Face checking of loblolly pine plywood was minimized by: (1) dipping panels for 10 seconds in a water repellent; (2) peeling veneer tight rather than loose; and (3) using veneer of low specific gravity rather than high. With all the above factors favorable, the average checking index was minimum at 2.4; if all were unfavorable, the checking index was 20.4.

KOCH, PETER.

1966. A SYSTEM FOR MANUFACTURING STRAIGHT STUDS FROM SOUTHERN PINE CORDWOOD. Southern Lumberman 213(2656): 165-169, illus.

Exceptionally straight studs can be profitably made by fingerjointing and gluing kiln-dry 4-foot sections from which all distortion has been removed by machining.

KOCH, PETER.

1966. STRAIGHT STUDS FROM SOUTHERN PINE VENEER CORES. U. S. Forest Serv. Res. Pap. SO-25, 37 pp., illus.

Cores can be profitably converted into 8-foot 2 by 4's meeting the strength and straightness requirements of Stud grade. Each core yields two studs.

▼KOCH, PETER.

1967. DEVELOPMENT OF THE CHIPPING HEADRIG. Proc. Rocky Mountain Forest Ind. Conf., pp. 135-155, illus.

A history of basic and applied research, with description of commercial applications.

KOCH, PETER.

1967. HISTORY OF WOOD MACHINING. Wood Sci. and Technol. 1(3): 180-183.

Brief sketch, with emphasis on developments in North America.

KOCH, PETER.

1967. LOCATION OF LAMINAE BY ELASTIC MODULUS MAY PERMIT MANUFACTURE OF VERY STRONG BEAMS FROM ROTARY-CUT SOUTHERN PINE VENEER. U. S. Forest Serv. Res. Pap. SO-30, 12 pp., illus.

With further research it should be possible to construct 18-inch-deep, 25-foot-long beams that will justify assignment of an allowable MOE of 2,400,000 p.s.i. and an allowable bending stress of 3,470 p.s.i. These beams would be of log-run, rotary-cut, thin, butt-jointed slash pine laminae arranged with the stiffest outermost in the highly stressed tension and compression zones and the most limber near the neutral axis.

KOCH, PETER.

1967. MINIMIZING AND PREDICTING DELAMINATION OF SOUTHERN PLYWOOD IN EXTERIOR EXPOSURE. Forest Prod. J. 17(2): 41-47, illus.

A regression accounting for 22 percent of the variation included, in order of importance: percent of wood failure (−), wet shear strength (−), specific gravity (+) and compression strength parallel to grain (−).

Koch, Peter.

1967. STRAIGHT STUDS ARE PRODUCED FROM SOUTHERN PINE CORDWOOD. Forest Ind. 94(5): 44-46, illus.

By machining all warp from dried stud blanks, exceptionally straight studs can be manufactured from 8-foot southern pine cordwood—two studs from every stick.

Koch, P.

1967. SUPER-STRENGTH BEAMS LAMINATED FROM ROTARY-CUT SOUTHERN PINE VENEER. Forest Prod. J. 17(6): 42-48, illus.

With laminae placed according to elastic modulus, extremely strong stiff beams were laminated from 1/6-inch veneer. In similar beams, when tension and compression zones were impregnated with polymethyl-methacrylate and then irradiated, strength and stiffness of the beams were increased. Comparable 7-inch-deep beams strengthened by having the outer six laminae on both sides densified by heat and pressure were further improved and averaged 22,090 p.s.i. stress in the outer laminae at failure. Effective modulus of elasticity of these beams was 3,040,000 p.s.i.

Koch, P.

1967. THROUGH RESEARCH: 2 × 4S FROM PLYWOOD BOLTS. Forests and People 17(1): 22-23, 37, 40, illus.

Very straight 8-foot studs can be manufactured from southern pine veneer cores.

▼Koch, P.

1967. TOO MANY CROOKED SMALL LOGS? CONSIDER A SHAPING-LATHE HEAD-RIG. Southern Lumberman 215(2680): 147-149, illus.

A fast, new experimental headrig can convert short logs or bolts into S4S cants that are square, polygonal, or round—and can cut these shapes tapered on all sides to conform to the natural taper of the log. The headrig makes no sawdust, but machines the entire volume outside the cant into flakes for flakeboard or into pulp chips.

Koch, P.

1968. CONVERTING SOUTHERN PINE WITH CHIPPING HEADRIGS. Proc. Forest Eng. Conf., Mich. State Univ., ASAE Publ. Proc. 368, p. 106-111. *Also in* South. Lumberman 217(2704): 131-138. *Also as* THREE FORMS OF THE CHIPPING HEADRIG. *In* Proc., High-Speed Headrig Conf., State Univ. Coll. For., Syracuse Univ., p. 3-23. 1969.

Illustrated account of the development and potentialities of what is likely to become the most important innovation in mechanical conversion since invention of the mechanical ringbarker.

Koch, Peter.

1968. STRAIGHT STUDS FROM SOUTHERN PINE VENEER CORES AND CORDWOOD. Forest Prod. J. 18(3): 28-30.

An economically feasible system has been developed for converting veneer cores into 8-foot studs—two studs per core. The process is also applicable to 8-foot bolts and, with modification, can be applied to 4-foot-long cordwood.

Koch, Peter.

1968. WOOD MACHINING ABSTRACTS, 1966 AND 1967. USDA Forest Serv. Res. Pap. SO-34, 38 pp.

Abstracts of some 300 references. An introduction mentions notable papers in various categories of endeavor and briefly surveys trends in wood utilization research.

▼Koch, Peter.

1968. WOOD MACHINING HIGHLIGHTS, 1966 AND 1967. Forest Prod. J. 18(9): 65-70.

Brief review; see entry above.

Koch, P.

1969. AT 240° F. SOUTHERN PINE STUDS CAN BE DRIED AND STEAM-STRAIGHTENED IN 24 HOURS. South. Lumberman 219(2723): 26, 28-29.

Though still under test, a new quick-drying process appears to have commercial applicability.

▼Koch, P.

1969. METHOD FOR PRODUCING STUDS FROM CORDWOOD AND VENEER CORES. (U. S. Pat. No. 3,443,612.) U. S. Pat. Office, Wash., D. C.

Describes procedures for making straight, kiln-dried studs from 4- and 8-foot cordwood and from pine veneer cores.

▼Koch, P.

1969. SHARING THE TREE. South. Lumberman 219 (2718): 18.

Chipping headrigs have made possible a system of wood procurement that efficiently channels tree segments into products of highest value; lumbermen, veneer manufacturers, and pulpmills can cooperate in the system to resolve their individual log-supply problems.

Koch, P.

1969. SPECIFIC HEAT OF OVENDRY SPRUCE PINE WOOD AND BARK. Wood Sci. 1: 203-214.

Essentially, the specific heat of wood had a positive linear correlation with temperature, while that of bark was a function of temperature squared. Wood of maximum specific heat was latewood from trees in the eastern part of the species' major range, and taken from heartwood close to ground level. Bark of maximum specific heat was from tops of fast-grown trees in the southern part of the range.

Koch, P.

1970. DELAMINATION OF SOUTHERN PINE PLYWOOD DURING THREE YEARS OF EXTERIOR EXPOSURE. Forest Prod. J. 20(11): 28-31.

Light gluespread or extension of glues with blood favored delamination, especially when the wood was of high specific gravity and assembly time was long. Rate of delamination decreased after 1 year, but effects of primary variables were

about the same after 3 years as after 6 months.

Koch, P.
1970. NEW PROCUREMENT APPROACH INCREASES PINE UTILIZATION. Forest Ind. 97(3): 46. *Also as* NEW PROCUREMENT APPROACH INCREASES VALUE AND UTILIZATION OF SMALL SOUTHERN PINE TREES. *In* Wood residue utilization, p. 32-35. Tex. Forest Prod. Lab., Lufkin. *Also as* NEW DEVELOPMENTS CHANGE PATTERNS OF PROCUREMENT AND MILL DESIGN. Tech. Pap. Am. Pulpwood Assoc., p. 13-17. 1971.
The chipping headrig is the key to a system under which sawmillers do all logging of small trees, regardless of land ownership, and then sell chips to pulpmills and high-quality bolts to plywood plants.

Koch, P., and Bohannan, Billy.
1965. BEAM STRENGTH AS AFFECTED BY PLACEMENT OF LAMINAE. Forest Prod. J. 15: 289-295, illus.
Beams laminated from 0.33-inch veneers sawn from 26-year-old slash pine were strongest (av. MOR 10,200 p.s.i.) and stiffest (av. MOE 2,130,000) and had least variability if arranged by elastic modulus—i. e., with the stiffest laminae on the outside and the most limber in the center. Progressively weaker beams were produced when laminae were arranged by appearance (freedom from knots), by specific gravity, and at random. Beams arranged by elastic modulus were stronger than solid-sawn members, and were further strengthened when faced with strips of aluminum.

▼Koch, P., and Jenkinson, Paul.
1965. MAXIMIZING DRY STRENGTH. Forest Prod. J. 15: 488-494, illus.
In dry loblolly pine plywood, true rolling shear strength was maximized at 578 p.s.i. by: (1) peeling tight to minimize depth of lathe checks; (2) using veneer from trees with specific gravity above 0.5; and (3) increasing gluespread. Compression strength parallel to the grain of the face and back veneer was maximized at 9,700 p.s.i. by: (1) using veneer of high specific gravity; (2) using veneer from slow-grown trees with more than 6 rings per inch; and (3) peeling veneer tight to minimize depth of checks. Modulus of elasticity of veneer in compression parallel to grain was maximized at 2,720,000 p.s.i. by using veneer from slow-growing trees of high specific gravity.

▼Koch, P., and McMillin. C. W.
1966. WOOD MACHINING REVIEW, 1963 THROUGH 1965. Forest Prod. J. Two parts. I.—16(9): 76-82, 107-115; II.—16(10): 43-48.
Abstracts of papers reporting significant research.

Koch, Peter, and Woodson, G. E.
1968. LAMINATING BUTT-JOINTED, LOG-RUN SOUTHERN PINE VENEERS INTO LONG BEAMS OF UNIFORM HIGH STRENGTH. Forest Prod. J. 18(10): 45-51.
It is possible to construct 18-inch-deep, 25-foot-long beams that justify assignment of an allowable MOE of 2,400,000 p.s.i. and an allowable bending stress of 3,470 p.s.i. The beams can be of rotary-cut slash pine laminae 1/6-inch thick and 100 inches long, and arranged in the beams with the stiffest outermost in the highly stressed tension and compression zones and the most limber near the neutral axis.

Laundrie, J. F., and McKnight, J. S.
1969. BUTT SWELLS OF WATER TUPELO FOR PULP AND PAPER. USDA Forest Serv. Res. Pap. FPL-119, 12 pp. Forest Prod. Lab., Madison, Wis.
Bleached kraft pulp from tupelo butts is of good quality and well suited for manufacture of greaseproof papers; the neutral sulfite semichemical pulps appear desirable for corrugating medium.

▼Lawrence, R. V.
1969. NAVAL STORES PRODUCTS FROM SOUTHERN PINES. Forest Prod. J. 19(9): 87-92.
Describes the four types of naval stores and mentions the uses to which they are put.

Lemoine, T. J., McMillin, C. W., and Manwiller, F. G.
1970. WOOD VARIABLES AFFECTING THE FRICTION COEFFICIENT OF SPRUCE PINE ON STEEL. Wood Sci. 2: 144-148.
The coefficient was at maximum for unextracted transverse surfaces of high moisture content pulled parallel to the growth rings. It was at minimum for extractive-free transverse surfaces of high moisture content pulled perpendicular to the rings.

Lockard, C. R., Putnam, J. A., and Carpenter, R. D.
1963. Grade defects in hardwood timber and logs. U. S. Dept. Agr., Agr. Handb. 244, 39 pp., illus.
Describes in words and pictures "the least understood determinants of log quality: those indicators, on the surfaces or ends of the logs, of quality-degrading blemishes in the interior."

McKnight, J. S.
1965. HARDWOOD USE AND FORESTRY IN THE U. S. Fifty-Sixth Ann. Meeting Amer. Railway Develop. Assoc. Proc., pp. 46-50.
Of the 244 million tons of wood harvested from U. S. forests annually, one-third is hardwood. Forestry for hardwoods aims for top quality and coordinated marketing of all round products.

▼McKnight, J. S.
1968. HARDWOOD LOG MARKETING SHOULD BE IMPROVED. Natl. Hardwood Mag. 42(3): 40-41. *Also in* Wildlife in North Carolina 33(5): 10. 1969.
Trees harvested from the forest must be channeled to their highest uses, both to reward the landowner for good management and to satisfy industrial needs for veneer bolts, saw logs, and pulpwood.

▼McMillin, C. W.
1968. CHEMICAL COMPOSITION OF LOBLOLLY PINE WOOD AS RELATED TO SPECIFIC GRAVITY, GROWTH RATE, AND DISTANCE FROM PITH. Wood Sci. and Technol. 2: (in press)
Alpha-cellulose, hemicellulose, holocellu-

lose, lignin, and extractive contents of wood factorially segregated by specific gravity, rings from the pith, and growth rate were determined from sample chips.

McMillin, C. W.

1968. FIBERBOARDS FROM LOBLOLLY PINE REFINER GROUNDWOOD: EFFECTS OF GROSS WOOD CHARACTERISTICS AND BOARD DENSITY. Forest Prod. J. 18(8): 51-59.

The gross wood properties of specific gravity, proportion of latewood, and growth rate affected the strengths of fiberboards in tension and bending, as well as their dimensional stability. For the refining conditions and formation procedures studied, and after allowance for the effect of board specific gravity, most properties were improved by using fiber refined from dense wood having low latewood content.

McMillin, C. W.

1968. GROSS WOOD CHARACTERISTICS AFFECTING PROPERTIES OF HANDSHEETS MADE FROM LOBLOLLY PINE REFINER GROUNDWOOD. TAPPI 51: 51-56.

Burst, tear, and breaking length were increased by applying high refining energy and using fast-grown wood of high latewood content but of relatively low density. To improve sheet density, only high refining energy and high proportion of latewood were required.

McMillin, C. W.

1968. MORPHOLOGICAL CHARACTERISTICS OF LOBLOLLY PINE WOOD AS RELATED TO SPECIFIC GRAVITY, GROWTH RATE AND DISTANCE FROM PITH. Wood Sci. and Technol. 2: 166-176.

Earlywood and latewood tracheid length and transverse dimensions, in wood factorially segregated by specific gravity, rings from pith, and growth rate, were determined from sample chips.

McMillin, C. W.

1969. ASH CONTENT OF LOBLOLLY PINE WOOD AS RELATED TO SPECIFIC GRAVITY, GROWTH RATE, AND DISTANCE FROM PITH. Wood Sci. 2: 26-30.

In earlywood of Pinus taeda *L. grown in central Louisiana, ash content generally decreased with increasing distance from the pith and increased with increases in rate of tree growth (as measured in rings per inch). Latewood ash content was unrelated to the gross wood factors of distance from the pith, specific gravity, and growth rate. The ash content of earlywood was higher (average 0.430 percent) than the ash content of latewood (average 0.389 percent).*

McMillin, C. W.

1969. ASPECTS OF FIBER MORPHOLOGY AFFECTING PROPERTIES OF HANDSHEETS MADE FROM LOBLOLLY PINE REFINER GROUNDWOOD. Wood Sci. and Technol. 3: 139-149.

Sheet properties were improved by using fiber refined from wood having long, narrow-diameter tracheids with thick walls. A theoretical stress analysis revealed that such tracheids fail by diagonal tension or parallel shear, depending on the fibril angle, while under torsion stress during refining. Such failures result in ribbon-like fragments necessary for coherence and strength development in mechanical pulps.

McMillin, C. W.

1969. FIBERBOARDS FROM LOBLOLLY PINE REFINER GROUNDWOOD: ASPECTS OF FIBER MORPHOLOGY. Forest Prod. J. 19(7): 56-61.

Most properties of wet-formed hardboard from loblolly pine were improved by using fibers refined from wood having short, slender tracheids with thin walls.

▼McMillin, C. W.

1969. PERFORMANCE EVALUATION OF STAINED, ROUGH-SAWN SOUTHERN PINE SIDING. Forest Prod. J. 19(2): 51-52.

Over a 2½-year span the siding has proved stable and has maintained an attractive appearance.

McMillin, C. W.

1969. QUALITY OF REFINER GROUNDWOOD PULP AS RELATED TO HANDSHEET PROPERTIES AND GROSS WOOD CHARACTERISTICS. Wood Sci. and Technol. 3: 287-300.

Pulp quality, in terms of a fiber shape factor S and a fiber length factor L, was determined for 96 pulps disk-refined from chips of varying characteristics. S was evaluated in terms of CSF of the 48/100 fiber length fraction and is therefore a parameter inversely proportional to specific surface. Properties were improved by using pulps displaying low values of S and relatively high values of L. Both S and L were related to specific refining energy and wood quality. S increased with increasing unextracted chip specific gravity and rings per inch of growth rate but decreased with increasing latewood content and refining energy. L decreased with increasing refining energy, rings per inch of growth rate, and unextracted chip specific gravity but increased with increasing latewood.

McMillin, C. W.

1969. SPECIFIC HEAT OF OVENDRY LOBLOLLY PINE WOOD. Wood Sci. 2: 107-111.

In the temperature range from 333 to 413 K., the specific heat was expressed by a linear function of temperature.

McMillin, C. W.

1969. WOOD CHEMICAL COMPOSITION AS RELATED TO PROPERTIES OF HANDSHEETS MADE FROM LOBLOLLY PINE REFINER GROUNDWOOD. Wood Sci. and Technol. 3: 232-238.

Burst and tear strengths of handsheets made from 48 pulps disk-refined from chips of varying chemical composition decreased with increasing extractive content after the independent effects of fiber morphology were specified. This result was attributed to lessened bond strength caused by reduced surface tension forces and blocking of reactive sites on the fiber surfaces.

McMillin, C. W.
1970. MINERAL CONTENT OF LOBLOLLY PINE WOOD AS RELATED TO SPECIFIC GRAVITY, GROWTH RATE, AND DISTANCE FROM PITH. Holzforschung 24 (5): 152-157.
In general, mineral contents decreased with increasing distance from the pith and were less in latewood than in earlywood.

McMillin, C. W.
1970. SPECIFIC HEAT OF SOME OVENDRY CHEMICAL CONSTITUENTS OF LOBLOLLY PINE WOOD. Wood Sci. 3: 52-53.
The specific heats of alpha-cellulose, holocellulose, lignin, and extractives were positive linear functions of temperature in the range of 333 to 413 Kelvin.

McMillin, C. W.
1970. WOOD MACHINING ABSTRACTS, 1968 AND 1969. USDA Forest Serv. Res. Pap. SO-58, 35 p.
A review of significant wood machining research that has not been previously digested in English-language texts and bibliographies.

▼ McMillin, C. W.
1970. WOOD MACHINING HIGHLIGHTS, 1968 AND 1969. Forest Prod. J. 20(9): 86-91.
See entry above.

McMillin, C. W., Lemoine, T. J., and Manwiller, F. G.
1970. FRICTION COEFFICIENT OF OVEN-DRY SPRUCE PINE ON STEEL, AS RELATED TO TEMPERATURE AND WOOD PROPERTIES. Wood & Fiber 2: 6-11.
The coefficient ranged from 0.10 to 0.25 and was negatively correlated with temperature for tangential earlywood, tangential latewood, and radial surfaces pulled parallel and perpendicular to the grain and for transverse surfaces pulled parallel and perpendicular to the annual rings.

McMillin, C. W., Lemoine, T. J., and Manwiller, F. G.
1970. FRICTION COEFFICIENT OF SPRUCE PINE ON STEEL —A NOTE ON LUBRICANTS. Wood Sci. 3: 100-101.
Generally, the introduction of water and ethanol increased the friction coefficient for ovendry samples but decreased the coefficient when the samples were saturated. Octanoic acid decreased the coefficient when samples were wet. In the entire experiment, coefficients ranged from 0.14 to 0.78.

Manwiller, F. G.
1966. SENARMONT COMPENSATION FOR DETERMINING FIBRIL ANGLES OF CELL WALL LAYERS. Forest Prod. J. 16(10): 26-30, illus.
Sections are cut at various angles to the long axis of the cells and birefringence of the layers measured under a polarizing microscope equipped with a Senarmont compensator. For each layer, the fibril angle is obtained from the maximum of the curve generated by plotting birefringence against section angle.

▼Manwiller, F. G.
1966. SOUTHERN PINE CELL WALLS AND SHRINKAGE. Southern Lumberman 213(2656): 184-186, illus.
Illustrates how warp in lumber originates in the cell walls of juvenile and compression wood.

▼Manwiller, F. G.
1967. TENSION WOOD ANATOMY OF SILVER MAPLE. Forest Prod. J. 17(1): 43-48, illus.
A tree leaning 20° contained greater concentrations of gelatinous fibers than did a tree leaning 10°, and these fibers differed from those of the 10° tree in layering sequence, fibril angles, and thicknesses of some layers.

▼Martin, R. E.
1969. CHARACTERIZATION OF SOUTHERN PINE BARKS. Forest Prod. J. 19(8): 23-30.
A review, with illustrations. In general, barks are less anistropic than wood, exhibit slightly lower heat transfer coefficients, and are much weaker. Data on bark anatomy are limited.

▼Meyer, J. A., and Loos, W. E.
1969. PROCESSES OF, AND PRODUCTS FROM, TREATING SOUTHERN PINE WOOD FOR MODIFICATION OF PROPERTIES. Forest Prod. J. 19(12): 32-38.
A review of major processes, with appraisal of their applicability to southern pine.

▼Moslemi, A. A.
1969. QUANTITATIVE COLOR CHARACTERIZATION FOR LOBLOLLY PINE VENEER. Wood Sci. 2: 61-64.
Average reflectance data showed no differences between measurements along and across the grain. Exposure outdoors for 100 days caused significant changes in the color of earlywood but not of latewood.

▼Nolan, W. J.
1969. SULFITE PULPING OF SOUTHERN PINE. Forest Prod. J. 19(9): 97-102.
A review. Data derived mostly from other species indicate that the southern pines can be pulped by sulfite processes. The stiff, bulky fibers of these pines will probably limit commercial application to processes whose liquors are neutral or only slightly acid.

Richardson, B. Y.
1967. SHAKING TREES TO COLLECT PINE CONES. Southern Lumberman 215(2680): 140-141, illus.
Shaking machines designed for pecan trees appear suitable for use on pines.

Richardson, B. Y., and Taylor, H. T.
1966. ENGINEERING RESEARCH IN THE FOREST SERVICE. Agr. Eng. 47: 382-383, illus.
The Forest Service has five laboratory groups studying major regional problems in forest engineering; all work in cooperation with the engineering departments of colleges or universities.

▼Richardson, B. Y., and Taylor, H. T., Jr.
1969. TRAFFICABILITY TESTS WITH A FORESTRY VEHICLE. Proc., Third Conf. Int. Soc. Terrain-Vehicle Syst. Vol. II, pp. 218-242.

In Nevada tests, articulated steering did not increase tractive performance when soil strength was the only variable.

▼Robinson, J. H., Smith, R. P., and Richardson, B. Y.
1969. TRAFFICABILITY TESTS WITH A RUBBER-TIRED LOG SKIDDER. U. S. Army Eng. Waterways Exp. Sta. Misc. Pap. M-69-1, 60 pp.
Performance of the skidder was related to soil strength in terms of rating cone index as defined by the U. S. Army Engineer Waterways Experiment Station. It was concluded that the Waterways Experiment Station trafficability system can be used for evaluating performance of timber-harvesting vehicles.

Rumsey, R. L.
1968. A POLE'S-EYE VIEW OF WOODPECKERS. Forests and People 18(2): 20-21, 38-40.
Scientists in Alexandria are seeking ways to protect wooden poles from woodpeckers.

Rumsey, R. L.
1970. WOODPECKER ATTACK ON UTILITY POLES—A REVIEW. Forest Prod. J. 20(11): 54-59.
Woodpeckers cause considerable damage to poles, and as yet there is no cheap or easy way to forestall their attacks. Coatings and wraps offer some promise of protecting poles by making the surface too hard for the birds to penetrate or to smooth to afford a perch.

▼Rumsey, R. L., and Biesterfeldt, R. C.
1970. WHY DO WOODPECKERS PECK ON POLES? Transm. & Distrib. 22(5): 50-51.
Poles offer the birds strategic locations for defending territories. Research in central Louisiana is aimed at finding ways of protecting the poles.

▼Rush, E. S.
1969. SOFT-SOIL PERFORMANCE OF A FOUR-WHEEL DRIVE LOG SKIDDER. Amer. Soc. Agr. Eng. Trans. 12: 546-549, 551.
Performance of the skidder was related to soil strength in terms of rating cone index as defined by the U. S. Army Engineer Waterways Experiment Station. It was concluded that the Waterways Experiment Station trafficability system can be used for evaluating performance of timber-harvesting vehicles.

▼Schultz, T. J.
1969. ACOUSTICAL PROPERTIES OF WOOD: A CRITIQUE OF THE LITERATURE AND A SURVEY OF PRACTICAL APPLICATIONS. Forest Prod. J. 19(2): 21-29.
" . . . There are certain acoustical hazards in the use of wood, and wood technologists must come to know them by getting acquainted with acoustical technology and its literature . . . . "

▼Sproull, R. C.
1969. FIBER, CHEMICAL, AND AGRICULTURAL PRODUCTS FROM SOUTHERN PINE BARK. Forest Prod. J. 19(10): 38-44.
A review. Most promising immediate uses of southern pine bark appear to be as fuel and soil amendments.

▼Stanley, R. G.
1969. EXTRACTIVES OF WOOD, BARK, AND NEEDLES OF THE SOUTHERN PINES. Forest Prod. J. 19(11): 50-56.
A review. Turpentine and resin acid are important byproduct extracts at pulpmills. Others, including carbohydrates, phenolic compounds, and proteins are possible sources for development.

▼Stern, E. G.
1969. MECHANICAL FASTENING OF SOUTHERN PINE—A REVIEW. Va. Polytech. Inst. Wood Res. & Wood Constr. Lab. Spec. Rep. 87, 98 p.
Discusses factors affecting performance of fasteners and summarizes data on holding ability.

▼Stokes, C. M., and Richardson, B. Y.
1967. MACHINE FOR CUTTING PINE FOREST UNDERGROWTH. Nav. Stores Rev. 77(8): 7, 17.
A specially designed cutter blade enables a commercial rotary mower to be used in clearing heavy undergrowth.

▼Suchsland, O.
1968. PARTICLE-BOARD FROM SOUTHERN PINE. South. Lumberman 217(2704): 139-144.
A review, concluding that the future of the southern pine particle-board industry will largely be determined by the economic availability of the raw material.

Suchsland, Otto, and Stevens, R. R.
1968. GLUABILITY OF SOUTHERN PINE VENEER DRIED AT HIGH TEMPERATURES. Forest Prod. J. 18(1): 38-42.
In an oven maintained at 500° F., veneer suffered no loss in gluability if it was taken out when surface temperature reached 425°.

▼Suddarth, S. K.
1969. THE ENGINEERING DESIGN OF MECHANICALLY FASTENED TRUSSES—A REVIEW. Wood Sci. 1: 193-199.
Because of connection flexibility, the trusses present difficulties in establishing methods for predicting stresses and displacements.

▼Tabor, H. B.
1968. DETERMINING CHIP-PIPELINE POTENTIALS WITH LINEAR PROGRAMMING. Forest Prod. J. 18(6): 29-33.
Under the assumptions of the analysis, chip pipelines would have some potential in southwest Alabama.

Taylor, H. T.
1967. PROGRESS IN SEED-COLLECTION METHODS. U. S. Forest Serv. Southeast. Area Forest Nurserymen's Conf. Proc. 1966: 67-68. U. S. Forest Serv. Southeast. Area, State and Priv. Forest.
New collection systems are being tried by the Southern Forest Experiment Station's engineering project at Auburn, Alabama, and by other agencies elsewhere.

Taylor, H. T., Jr.
1968. ENGINEERED SYSTEM FOR COLLECTING GUM NAVAL STORES. Proc., Forest Eng. Conf. ASAE Pub.

PROC-368, pp. 52-53.
With pneumatic chipping tools, chemical stimulant paste, disposable gum cups, and a gyro-carrier for transportation, three men should be able to collect as much gum in 1 year as 12 now collect.

▼Taylor, H. T., Jr.
1970. harvesting complete trees. *In* Renewable natural resources, p. 51-54. Proc., First Annu. Forest. & Wildl. Forum. Va. Polytech. Inst. Ext. Div.
If trees could be harvested by shaking the roots loose from the soil, considerable fiber might be retrieved from portions now wasted. Perhaps the vibrators would also detach the tree from its bark.

▼Thompson, W. S.
1969. effect of chemicals, chemical atmospheres, and contact with metals on southern pine wood: a review. Miss. State Univ. Forest Prod. Util. Lab. Res. Rep. 6, 33 pp.
The review on chemical effects is limited to literature on resistance of wood to degradation during processing and in service.

Thompson, W. S., and Darwin, W. N.
1968. weight, volume, and moisture content of sawdust from selected southern species. Forest Prod. J. 18(9): 96.
Ovendry weight of sawdust appears to be about one-third the ovendry weight of solid wood.

▼Trevelyan, B. J.
1969. mechanical pulping of southern pine wood. Forest Prod. J. 19(1): 29-38.
Reviews the 30-year history of the newsprint industry in the South, discusses modern practices and equipment in groundwood operations, and appraises opportunities for development.

▼Wakeley, P. C.
1969. effects of evolution on southern pine wood. Forest Prod. J. 19(2): 16-20.
During the past 180 million years, the southern pines have migrated from some of the oldest land masses to some of the most recent. The courses of evolution and migration may prove guides to research on wood qualities.

▼Wangaard, F. F.
1969. cell-wall density of wood with particular reference to the southern pines. Wood Sci. 1: 222-226.
Reviews the subject, reports recent work refuting the theory that dry cell walls are highly porous, and offers a procedure for calculating void volumes of dry cell walls.

▼Wangaard, F. F.
1969. heat transmissivity of southern pine wood, plywood, fiberboard, and particleboard. Wood Sci. 2: 54-60.
Summarizes and compares data on thermal conductivity and on relationships between thermal conductivity, density, and moisture.

Weldon, Dewayne.
1966. the volume and location of southern yellow pine bark in east texas. Tex. Forest Serv. Circ. 101, 7 pp., illus.
About 1,900 tons accumulate daily at sawmills, pulpmills, plywood plants, and pole yards—mostly in the southeastern counties.

Weldon, Dewayne.
1967. volume and location of southern yellow pine sawdust in east texas. Tex. Forest Serv. Circ. 106, 10 pp., illus.
About 2,100 tons are produced daily, mostly in 17 southeastern counties.

▼Wellons, J. D.
1970. cell wall polysaccharides in southern pine wood—a review. Wood Sci. 2: 247-254.
Cellulose, glucomannans, and xylan from southern pine wood seem to be structurally and quantitatively the same as those from other conifers.

Woodson, G. E., and Koch, P.
1970. tool forces and chip formation in orthogonal cutting of loblolly pine. USDA Forest Serv. Res. Pap. SO-52, 25 p.
One-tenth-inch-thick specimens of earlywood and latewood of Pinus taeda *L. were cut at 2 inches per minute orthogonally—as with a carpenter's plane—in the three major modes, i. e., planing (90-0), veneer (0-90), and crosscut (90-90) directions. Parallel and normal cutting forces for various rake angles were measured at three moisture contents and four depths of cut.*

Woodson, G. E., and Wangaard, F. F.
1969. effect of forming stresses on the strength of curved laminated beams of loblolly pine. Forest Prod. J. 19(3): 47-58.
In curved beams of thin, vertical-grain laminae of clear wood, strength retention decreases with increasing severity of curvature, but not to the degree suggested by Wilson's equation. When loaded on the convex face these beams are stronger than when loaded on the concave face.

▼Zicherman, J. B.
1969. painting of southern pine. Forest Prod. J. 19(4): 44-51.
A review. Southern pine can be painted to yield exterior performance comparable to that of the so-called easy-to-paint species.

MEASUREMENT

Avery, T. E.
1966. FORESTER'S GUIDE TO AERIAL PHOTO INTERPRETATION. U. S. Dep. Agr., Agr. Handbook 308, 40 pp., illus.
A practical reference on techniques of photo interpretation in forest inventory. Applicable in most of the U. S. and parts of Canada.

Blair, R. M.
1963. Lightweight collapsible plot frame. Jour. Range Mangt. 16: 28-29, illus.
Directions for making a portable frame of steel tubing, to delineate plots in range and forest inventories.

▼Bower, D. R.
1962. VOLUME-WEIGHT RELATIONSHIPS FOR LOBLOLLY PINE SAWLOGS. Jour. Forestry 60: 411-412.
In an analysis of both individual logs and truckloads, weights per M decreased with increasing log diameter.

Bower, D. R.
1970. ROUNDING EFFECTS IN SIMPLE LINEAR REGRESSION. Forest Sci. 16: 301-303.
In simple linear regressions relating tree diameters at the beginning and end of 15- and 20-year periods, increasing the measurement interval for the independent variable from tenths of inches to whole inches caused an 8.7-percent negative bias in the estimated slope, an average loss of 6.2 percent in r^2, and an increase in mean squared residuals of 29.2 percent. Bias and loss in precision occurred in both large and small samples.

▼Bower, D. R., and Blocker, W. W.
1966. ACCURACY OF BANDS AND TAPE FOR MEASURING DIAMETER INCREMENTS. J. Forest. 64: 21-22, illus.
On shortleaf pines in Arkansas, newly installed dendrometer bands understated growth until the average tree had gained 0.15 inch in diameter. With a vernier diameter tape, two-season growth was measured to ±0.03 inch on 19 out of 20 trees, and the average difference between the tape and checkbands was only 0.003 inch.

Brendemuehl, R. H., and Baker, J. B.
1965. SECTIONAL POLE FOR MEASURING TREE HEIGHTS. U. S. Forest Serv. Res. Note SO-20, 2 pp., illus.
Details for constructing and using an aluminum pole that is convenient, light, and durable.

Burton, J. D.
1962. BARK THICKNESS IN TENNESSEE LOBLOLLY PLANTATIONS. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 142, illus.
Double bark thickness = 0.17 + 0.156 d.b.h.

▼Coyne, J. F.
1965. COLLECTING SMALL SAMPLES OF OLEORESIN. J. Forest. 63: 700, illus.
Screwing bottles and vials directly into tree boles prevents loss of volatile components and enhances gum flow by retarding crystallization.

▼Davis, K. P., Briegleb, P. A., Fedkiw, J., and Grosenbaugh, L. R.
1962. DETERMINATION OF ALLOWABLE ANNUAL TIMBER CUT ON FORTY-TWO WESTERN NATIONAL FORESTS. U. S. Dept. Agr., Forest Serv. M-1299, 40 pp.
Objectives, problems, and methods: an analysis with recommendations.

Dodge, W. G., and Miller, H. R.
1968. OLEORESIN EXUDATION PRESSURE RECORDER. USDA Forest Serv. Res. Note SO-71, 2 pp.
A device for making reliable, continuous observations at any distance below the bark of a pine tree.

▼Enghardt, Hans, and Derr, H. J.
1963. Height accumulation for rapid estimates of cubic volume. Jour. Forestry 61: 134-137, illus.
In young plantations, Grosenbaugh's height-accumulation method required less effort than conventional means and gave accuracy desired for research purposes.

Freese, F.
1962. ELEMENTARY FOREST SAMPLING. USDA Agric. Handb. 232, 91 p. *Also as* MUESTREO FORESTAL ELEMENTAL. Bol. Divulgativo 25, 191 p. Inst. Nac. Invest. For., Subsecr. For. Fauna, Secr. Agric. Ganad. Mexico. 1970. Transl. M. C. Deloya. Also transl. under English title, by Catedra De Dasometria Y Ordenacion, Escuela Tecnica Superior de Ingenieros de Montes, Ciudad Univ., Madrid, Spain. 70 p.
"This is a statistical cookbook. It presents recipes for a number of sampling methods that have been found useful in forestry."

Freese, Frank.
1967. ELEMENTARY STATISTICAL METHODS FOR FORESTERS. U. S. Dep. Agr., Agr. Handbook 317, 87 pp., illus.
"The purpose . . . is to give the reader a handy reference for useful basic techniques and also to convince him that statistical methods can be learned."

▼Grano, C. X.
1963. Increment borer starting device. Jour. Forestry 61: 678-679, illus.
Construction and use.

▼Guttenberg, Sam.
1962. COMPUTER PROGRAMS OF INTEREST FOR THE PULP INDUSTRY. Amer. Pulpwood Assoc. Tech. Paper 62-TP-102, 6 pp.
The Southern Forest Experiment Station's experiences with electronic data-processing probably typify those that will be encountered by forest industry.

Halls, L. K., and Dell, T. R.
1966. TRIAL OF RANKED-SET SAMPLING FOR FORAGE

YIELDS. Forest Sci. 12: 22-26, illus.

Ranked-set sampling was considerably more efficient than random sampling for estimating weights of browse and herbage in a pine-hardwood forest of east Texas. The procedure was to establish sets of three closely grouped quadrats, visually rank quadrats within sets as highest, intermediate, or lowest in forage weight, and then clip and weigh forage from one quadrat of each set.

HODGES, J. D., AND LORIO, P. L., JR.

1968. MEASUREMENT OF OLEORESIN EXUDATION PRESSURE IN LOBLOLLY PINE. Forest Sci. 14: 75-76.

Glass capillary tubes, sealed at one end and inserted in a tight-fitting hole in the tree, give satisfactory readings and are cheap enough to be discarded after each use.

JUDSON, G. M.

1964. INEXPENSIVE AND ACCURATE FORM-CLASS ESTIMATES. U. S. Forest Serv. Res. Paper SO-11, 6 pp., illus.

Regressions developed from Louisiana data provide a basis for estimating form class closely. Tests in Alabama suggest that the relationships are widely applicable. Their use requires measurements of d.b.h., bark thickness at d.b.h., and diameter outside bark at 17.3 feet—the last value being readily obtainable with optical calipers.

LOHREY, R. E., AND DELL, T. R.

1969. COMPUTER PROGRAMS USING HEIGHT ACCUMULATION FOR TREE VOLUMES AND PLOT SUMMARIES. J. Forest. 67: 554-555.

Two new programs compute volumes of individual sample trees by the height-accumulation method and summarize cut and leave volumes on a per-acre basis, with options for units of measure, top diameters, d.b.h. thresholds, and other factors.

▼MESAVAGE, CLEMENT.

1964. CORE EXAMINATION KIT. Jour. Forestry 62: 635, illus.

Components of a simple, useful kit are easily made or purchased.

▼MESAVAGE, CLEMENT.

1964. DRAFTING TABLE FOR FIELD PROJECTS. U. S. Forest Serv. Fire Control Notes 25(4): 14, illus.

Directions for making a portable drafting and light table.

▼MESAVAGE, CLEMENT.

1965. AIDS FOR USING BARR AND STROUD DENDROMETERS. Soc. Amer. Forest. Proc. 1964: 238-244, illus.

The aids include an aiming device to facilitate sighting, a transit-mount to insure stable instrument settings and fine adjustments, a field chart to translate instrument readings into tree diameters, and tables to reduce trigonometric calculations for determining tree height or for setting the sights to a given height.

MESAVAGE, CLEMENT.

1965. DEFINITION OF MERCHANTABLE SAWTIMBER HEIGHT. J. Forest. 63: 30-32, illus.

Gross merchantable sawtimber height can be precisely ascertained by limiting the top saw log to a length beyond which excessive taper prevents increase in scale. The method removes ambiguity in defining length and assures an accurate basis for determining maximum gross tree board-foot volume. An easily constructed taper-scope aids in examining standing trees to locate the point where excessive taper begins.

MESAVAGE, CLEMENT.

1965. THREE-P SAMPLING AND DENDROMETRY FOR BETTER TIMBER ESTIMATING. Southern Lumberman 211 (2632): 107-109, illus.

A system conceived by L. R. Grosenbaugh exploits new field instruments, electronic data processing, and a new sampling concept in a manner that will eventually revolutionize timber cruising.

MESAVAGE, CLEMENT.

1967. MODIFICATION OF FP12 BARR AND STROUD DENDROMETER FOR EASIER FIELD USE. U. S. Forest Serv. Res. Note SO-50, 3 pp., illus.

The modifications comprise an aiming device, a transparent lens barrel, and a tripod that adjusts to rough terrain and includes a worm gear for fine adjustment of vertical tilt.

MESAVAGE, CLEMENT.

1967. RANDOM INTEGER DISPENSER. U. S. Forest Serv. Res. Note SO-49, 3 pp., illus.

The dispenser accommodates lists of random numbers for 3P sampling and other types of sample enumeration.

MESAVAGE, CLEMENT.

1968. REVISED CALCULATOR FOR BARR AND STROUD DENDROMETERS. USDA Forest Serv. Res. Note SO-84, 4 pp.

With pasted-on scales, a slide rule can be used to field-check readings made with all models of Barr and Stroud dendrometers.

MESAVAGE, C.

1969. CONVERTING DENDROMETER ESTIMATES OF OUTSIDE-BARK STEM DIAMETERS TO WOOD DIAMETERS ON MAJOR SOUTHERN PINES. USDA Forest Serv. Res. Note SO-93, 4 pp.

Bark thickness for these species diminishes up the stem and can be predicted adequately by the corresponding option in Grosenbaugh's STX computer program for processing tree measurements.

MESAVAGE, C.

1969. MEASURING BARK THICKNESS. J. Forest. 67: 753-754.

Procedures for reducing errors due to ambiguous readings of the bark-measuring gage, inadequate sampling of bark thickness, and incorrect seating of the measuring chisel.

MESAVAGE, C.
1969. MODIFICATION OF A ZEISS TELEMETER TELETOP FOR PRECISION DENDROMETRY. USDA Forest Serv. Res. Note SO-95, 7 pp.
The optical system of a Zeiss Telemeter Teletop was modified to form the prototype of a magnifying dendrometer with coincident split images for measuring distance, height, and diameter.

MESAVAGE, C.
1969. NEW BARR AND STROUD DENDROMETER MODEL FP15. J. Forest. 67: 40-41.
A number of improvements, largely suggested by American mensurationists, adapt the new model to rough terrain and eliminate some sources of error and inconvenience.

NELSON, T. C.
1967. TRENDS IN MENSURATION RESEARCH IN THE SOUTHERN UNITED STATES. *In* 14th Congr. Proc., Int. Union Forest. Res. Organ. Vol. 6: 404-409.
The research today encompasses many aspects of a mensuration-forest management-forest economics complex.

SCHMITT, D., AND BOWER, D. R.
1970. VOLUME TABLES FOR YOUNG LOBLOLLY, SLASH, AND LONGLEAF PINES IN PLANTATIONS IN SOUTH MISSISSIPPI. USDA Forest Serv. Res. Note SO-102, 6 p.
Data in 7-year-old plantations are the basis for tables of total cubic-foot volume, inside bark, for loblolly, slash, and longleaf pines ranging from 1 to 8 inches in diameter.

SHELBOURNE, C. J. A., AND NAMKOONG, GENE.
1966. PHOTOGRAMMETRIC TECHNIQUE FOR MEASURING BOLE STRAIGHTNESS. Eighth Southern Conf. on Forest Tree Impr. Proc. 1965: 131-136, illus.
Straightness and lean parameters of a tree are described and measured on two photos taken at right angles to each other.

▼SIEGEL, W. C.
1964. TIMBER BY THE POUND—A GROWING TREND. Pulpwood Prod. 12(12): 22-23, illus.
Truck scales for timber are now found in nearly every southern State. Locations of 151 are mapped; nearly one-third are in Georgia. Pulpwood scales outnumber saw log scales by more than four to one.

SMALLEY, G. W., AND BOWER, D. R.
1968. VOLUME TABLES AND POINT-SAMPLING FACTORS FOR LOBLOLLY PINES IN PLANTATIONS ON ABANDONED FIELDS IN TENNESSEE, ALABAMA, AND GEORGIA HIGHLANDS. USDA Forest Serv. Res. Pap. SO-32, 13 pp.
Volumes are in cubic feet to tops of 0.0, 2.0, 3.0, and 4.0 inches. Weighted volume equations derived from data on 196 felled trees which equalled or exceeded 5.0 inches d.b.h. are of the form $V(D^2H)^{-1} = b_1 + b_0(D^2H)^{-1}$. *Tables of volumes per square foot of basal area are included.*

SMALLEY, G. W., AND BOWER, D. R.
1968. VOLUME TABLES AND POINT-SAMPLING FACTORS FOR SHORTLEAF PINES IN PLANTATIONS ON ABANDONED FIELDS IN TENNESSEE, ALABAMA, AND GEORGIA HIGHLANDS. USDA Forest Serv. Res. Pap. SO-39, 13 pp.
Volumes are in cubic feet to tops of 0.0 2.0, 3.0, and 4.0 inches. Weighted volume equations derived from data on 168 felled trees which equalled or exceeded 5.0 inches d.b.h. are of the form $V(D^2H)^{-1}$ $b_1 + b_0 (D^2H)^{-1}$. *Tables of volume per square foot of basal area are included.*

VAN SICKLE, C. C.
1966. FACTORS FOR CONVERTING MIDSOUTH PULPWOOD FROM CORES TO CUBIC FEET. USDA Forest Serv. Res. Note SO-45, 2 p. *Also in* Pulpwood Prod. 15(8): 16. 1967.
Volume of solid wood per standard cord is greater in pine pulpwood than in hardwood, and higher in the West Gulf than in the East Gulf.

▼WHEELER, P. R.
1962. PENTA PRISM CALIPER FOR UPPER-STEM DIAMETER MEASUREMENTS. Jour. Forestry 60: 877-878, illus.
Direct view of one side of a tree stem is brought into coincidence with reflection of the other side through two penta prisms, one fixed and one movable. Diameter is read on a scale through the prisms.

WILCOX, J. R., SNYDER, E. B., AND MORROW, J. P.
1964. MODIFICATIONS OF THE AMPLISCOPE FOR MEASURING HARDWOOD FIBERS. Jour. Forestry 62: 581.
Simple optics formulas aid in constructing an ampliscope or increasing the magnification of an existing model.

WILLIAMS, D. L., AND HOPKINS, W. C.
1968. CONVERTING FACTORS FOR SOUTHERN PINE PRODUCTS. La. State Univ. Agr. Exp. Sta. Bull. 626, 89 pp.
Factors for cord volume, log scale, cubic volume, log grades and lumber yields, veneer and plywood, and weights of pulpwood, sawtimber, and lumber. Ninety-seven tables, 10 charts.

YOCOM, H. A.
1970. VERNIER SCALES FOR DIAMETER TAPES. J. Forest. 68: 725.
If tree diameters must be measured to 0.01 inch, a vernier scale inscribed on a standard diameter tape serves well.

RANGE

▼ Blaisdell, J. P., Duvall, V. L., Harris, R. W., and others.
1970. range ecosystem research—the challenge of change. USDA Agr. Inform. Bull. 346, 26 p.
The state of range management knowledge in relation to goals of society was considered by a Forest Service committee.

▼ Blaisdell, J. P., Duvall, V. L., Harris, R. W., and others.
1970. range research to meet new challenges and goals. J. Range Manage. 23: 227-234.
See entry above.

Boyer, W. D.
1967. grazing hampers development of longleaf pine seedlings in southwest alabama. J. Forest. 65: 336-338, illus.
During the seedlings' first 5 years, light grazing killed 23 percent and reduced rootcollar diameter growth of survivors by 13 percent.

▼ Campbell, R. S.
1963. Why range research—and how. *In* Range research methods: a symposium, Denver, Colorado, May 1962. U. S. Dept. Agr. Misc. Pub. 940, pp. 1-4.
Introductory paper, summarizing objectives of range and wildlife habitat research in the U. S. Forest Service, and discussing dynamic nature of the range and methodology and attitudes required for successful research.

Campbell, R. S.
1966. managing native grasslands for long-season grazing in the southern united states. Proc., IX Int. Grassland Congr., pp. 1405-1407.
These grasslands have ample forage for cattle, but nutrient quality varies seasonally, being high in spring, good in summer, and fair to poor thereafter.

Campbell, R. S., Halls, L. K., and Morgan, H. P.
1963. Selected bibliography on southern range management. U. S. Forest Serv. Res. Paper SO-2, 62 pp. South. Forest Expt. Sta., New Orleans, La.
Classified by subject matter, and with index of authors.

▼ Duvall, V. L.
1962. burning and grazing increase herbage on slender bluestem range. Jour. Range Mangt. 15: 14-16, illus.
Chiefly because they prevented large accumulations of grass litter, burning and grazing increased forage yields.

▼ Duvall, V. L.
1963. Beefing up forest income. South. Lumberman 207(2585): 80-82, illus.
See abstract under Duvall and Whitaker, 1963 .

▼ Duvall, V. L.
1964. benefits from good management on southern forest ranges. Jour. Range Mangt. 17: 156-157, illus.
Cottonseed cake in moderate amounts from late October to May, salt and bonemeal year long, and a small amount of hay in late winter permit efficient cattle operations on bluestem range.

▼ Duvall, V. L.
1964. how much beef from native cows grazing forest range? Gulf Coast Cattleman 30(5): 10-11, 14, illus.
In central Louisiana, ordinary herds under good management yielded 80 percent calf crops, and weaning weights averaged 441 pounds at 6½ months.

Duvall, V. L.
1966. reactions of longleaf pine-bluestem range to grazing and burning. Proc., IX Int. Grassland Congr., pp. 1339-1343, illus.
In a 12-year test in Louisiana, grazed range yielded 465 pounds more dry grass per acre annually than ungrazed. Yearly grass production was unaffected by prescribed burns at intervals of 4 or 5 years.

Duvall, V. L.
1968. demarcation of small plots with spring-loaded wires. J. Range Manage. 21: 269.
Wires have some advantages over frames for delineating plot boundaries.

Duvall, V. L.
1969. comparison of supplementation methods for cow herds grazing pine-bluestem range. J. Range Manage. 22: 182-187.
Range cows furnished cottonseed cake on alternate days in winter weighed more and had higher calving percentages than cows fed daily. Calf weights at weaning were similar. Cost of distributing cake every other day was almost 40 percent less than for the daily schedule. Cows self-fed cottonseed meal adulterated with salt weighed as much as those fed cake daily, but both calf crop and weaning weight averaged less than for daily or alternate-day feeding.

▼ Duvall, V. L.
1970. manipulation of forage quality: objectives, procedures, and economic considerations. *In* Range and wildlife habitat evaluation—a research symposium, p. 19-24. USDA Misc. Pub. 1147.
Forage quality can often be improved by fertilizing, burning, seeding, or altering grazing patterns on a range, but cattle seldom gain enough to justify the costs of treatment. Range managers should

probably choose measures that will increase grazing capacity, and regard increased quality as a secondary objective.

▼Duvall, V. L., and Blair, R. M.
1963. Terminology and definitions. *In* Range research methods: a symposium, Denver, Colorado, May 1962. U. S. Dept. Agr. Misc. Pub. 940, pp. 8-11.
Terminology of range and wildlife management, and ecology, is often ambiguous. These sciences would benefit from a glossary of accepted meanings; suggests definitions for 22 terms.

Duvall, V. L., and Grelen, H. E.
1967. FERTILIZATION UNECONOMIC FOR FORAGE IMPROVEMENT IN LOUISIANA PINE PLANTATIONS. U. S. Forest Serv. Res. Note SO-51, 3 pp.
Applying 100 pounds per acre each of N, P, and K increased yield more than threefold and improved phosphorus content of herbage. N, applied at 200 pounds per acre, increased herbage protein. But these improvements, though substantial, were inadequate to justify costs.

▼Duvall, V. L., and Halls, L. K.
1963. Outlook for beef cattle on southern forest ranges. Soc. Amer. Foresters Proc. 1962: 76-79, illus.
Range grazing is profitable if efficiently managed, and beef will probably continue to be a major product of southern pine forests, especially in the longleaf-slash pine types.

▼Duvall, V. L., and Hansard, S. L.
1967. RESPONSES OF SOUTHERN RANGE CATTLE TO PROTEIN SUPPLEMENTATION. J. Range Manage. 20: 153-157, illus.
Among beef cows grazing yearlong on pine forest range in Louisiana, those receiving 312 pounds of cottonseed cake annually between November 1 and March 31 performed as well as those fed greater quantities for longer periods.

▼Duvall, V. L., and Hilmon, J. B.
1965. NEW GRAZING RESEARCH PROGRAMS FOR SOUTHERN FOREST RANGES. J. Range Manage. 18: 132-136, illus.
Large-scale reforestation is complicating the problems of integrating grazing with timber growing, and research aims of the U. S. Forest Service are shifting accordingly.

Duvall, V. L., Johnson, A. W., and Yarlett, L. L.
1968. SELECTED BIBLIOGRAPHY ON SOUTHERN RANGE MANAGEMENT, 1962-1967. USDA Forest Serv. Res. Pap. SO-38, 34 pp.
About 650 references, classified by subject matter, and with index of authors.

▼Duvall, V. L., and Linnartz, N. E.
1967. INFLUENCES OF GRAZING AND FIRE ON VEGETATION AND SOIL OF LONGLEAF PINE-BLUESTEM RANGE. J. Range Manage. 20: 241-247, illus.
Herbage yield and density of cover were greater on moderately or heavily grazed than on ungrazed range. Botanical composition remained relatively constant under moderate use but changed markedly on ungrazed and heavily grazed ranges. Grazing compacted soils, but insufficiently to impair herbage growth or accelerate erosion. Fire had little long-range effect.

▼Duvall, V. L., and Whitaker, L. B.
1962. BOOSTING BEEF YIELDS ON FOREST RANGE. Forests and People 12(3): 24-25, 42, 44, 46. *Also as* BEEF YIELDS TRIPLED ON FOREST RANGES WITH LITTLE INVESTMENT. Forest World 1(4): 42-45. 1963.
A practical combination of supplemental feeding, herd management, and controlled grazing tripled income from native cattle grazing cutover longleaf pine land in central Louisiana.

Duvall, V. L., and Whitaker, L. B.
1963. Supplemental feeding increases beef production on bluestem-longleaf pine ranges. La. Agr. Expt. Sta. Bul. 564, 18 pp., illus.
Cottonseed cake in moderate amounts from late October until May, salt and bonemeal yearlong, and a small amount of hay in late winter permit efficient cattle operations on bluestem range.

Duvall, V. L., and Whitaker, L. B.
1964. ROTATION BURNING: A FORAGE MANAGEMENT SYSTEM FOR LONGLEAF PINE-BLUESTEM RANGES. Jour. Range Mangt. 17: 322-326, illus.
In a Louisiana test, heavy utilization during growing seasons following fires at 3-year intervals improved palatability and nutritive content; the ensuing 2 years of lighter use restored plant vigor. Burning also top-killed brush and aided herbage growth by removing pine litter. Cows with calves gained weight throughout the growing season.

Duvall, V. L., and Whitaker, L. B.
1970. FACTORS INFLUENCING INTAKE OF MINERAL SUPPLEMENTS BY CATTLE ON SOUTHERN FOREST RANGES. J. Range Manage. 23: 347-350.
Among cattle grazing yearlong on pine-bluestem range, intake of both salt and bonemeal varied with grazing intensity and the frequency with which protein supplement was fed.

▼Evans, T. C., O'Regan, W. G., . . . and Halls, L. K.
1963. Committee report on vegetation measurement and sampling. *In* Range research methods: a symposium, Denver, Colorado, May 1962. U. S. Dept. Agr. Misc. Pub. 940, pp. 60-63.
Lists measurement problems requiring research and proposes formation of biometrics unit to deal with them.

▼Grelen, H. E.
1962. PLANT SUCCESSION ON CLEARED SANDHILLS IN NORTHWEST FLORIDA. Amer. Midland Nat. 67: 36-44, illus.
Annual composites dominated the earliest stage of succession. Annual grasses were scarce, but two perennials, Panicum malacon *and* Leptoloma cognatum, *came in quickly. At the end of 4 years,* Eupatorium compositifolium *was the dominant herb.* Andropogon virginicus *increased steadily after the second year. Scrub oaks and* Aristida stricta, *which dominate uncleared areas, occurred only as scattered plants.*

GRELEN, H. E.
1964. FUMIDOR FOR HERBARIUM CASES. Jour. Range Mangt. 17: 155-156, illus.
A small aluminum-screen box attached to herbarium shelves by magnets, holds a month's supply of paradichlorobenzene crystals.

GRELEN, H. E.
1967. COMPARISON OF CAGE METHODS FOR DETERMINING UTILIZATION ON PINE-BLUESTEM RANGE. J. Range Manage. 20: 94-96.
Plucking herbage from caged quadrats to stimulate grazing resulted in lower estimates of yield and utilization than did monthly or yearly clipping of herbage from caged and open quadrats. At the end of the grazing season, estimates of ungrazed herbage did not differ significantly by measurement technique.

GRELEN, H. E., AND DUVALL, V. L.
1966. COMMON PLANTS OF LONGLEAF PINE-BLUESTEM RANGE. U. S. Forest Serv. Res. Pap. SO-23, 96 pp., illus.
Descriptions and botanical drawings of more than 80 understory species, with notes on values for cattle and wildlife.

GRELEN, H. E., AND EPPS, E. A., JR.
1967. HERBAGE RESPONSES TO FIRE AND LITTER REMOVAL ON SOUTHERN BLUESTEM RANGE. J. Range Manage. 20: 403-404, illus.
Yield and nutrient content on burned plots differed little from that on plots that were closely mowed and raked. Thus the benefits of burning were attributed mainly to litter removal.

GRELEN, H. E., AND EPPS, E. A., JR.
1967. SEASON OF BURNING AFFECTS HERBAGE QUALITY AND YIELD ON PINE-BLUESTEM RANGE. J. Range Manage. 20: 31-33, illus.
Burning different portions of a range in winter, spring, and summer provided adequate protein in herbage for a much longer period than winter burning alone. Phosphorus was deficient the year around regardless of burning schedule.

HALLS, L. K.
1966. FORAGE AND CATTLE PRODUCTION IN LONGLEAF-SLASH PINE FORESTS. Proc., IX Int. Grassland Congr., pp. 1609-1612, illus.
Requisites for success include feeding supplements to compensate for deficiencies in the range forage; selecting Brahman-cross cows; increasing forage quality and quantity through prescribed burning and controlling tree density; grazing at proper intensity; and regulating cattle distribution, numbers, and season of grazing, so as to prevent damage to the trees.

▼HALLS, L. K., AND CRAWFORD, H. S.
1965. VEGETATION RESPONSE TO AN OZARK WOODLAND SPRAYING. J. Range Manage. 18: 338-340, illus.
Aerial spraying with 2,4,5-T temporarily increased yields of grasses preferred by cattle. Reinvasion of woody plants and heavy grazing by cattle contributed to a subsequent decline in yields of grass. The invading shrubs included many species preferred by deer.

HALLS, L. K., HUGHES, R. H., RUMMELL, R. S., AND SOUTHWELL, B. L.
1964. FORAGE AND CATTLE MANAGEMENT IN LONGLEAF-SLASH PINE FORESTS. U. S. Dept. Agr. Farmers' Bul. 2199, 25 pp., illus.
Information especially for the bluestem and the pineland threeawn range types.

HALLS, L. K., AND SCHUSTER, J. L.
1965. TREE-HERBAGE RELATIONS IN PINE-HARDWOOD FORESTS OF TEXAS. J. Forest. 63: 282-283, illus.
Grass and total herbage decreased with increasing tree cover. Tree basal area was less closely associated.

LINNARTZ, N. E., HSE, CHUNG-YUN, AND DUVALL, V. L.
1966. GRAZING IMPAIRS PHYSICAL PROPERTIES OF A FOREST SOIL IN CENTRAL LOUISIANA. J. Forest. 64: 239-243, illus.
Ten years of grazing during spring and summer compacted soil sufficiently to restrict water movement into and through the profile, especially during intense rainstorms. Heavy grazing was more damaging than moderate.

▼SCHUSTER, J. L.
1964. ROOT DEVELOPMENT OF NATIVE PLANTS UNDER THREE GRAZING INTENSITIES. Ecol. 45: 63-70, illus.
On the Front Range of Colorado, root weights of grasses were greater on ungrazed range than on ranges given moderate or heavy use. Root weights of other plants did not vary significantly.

SCHUSTER, J. L., AND DUKE, W. B.
1964. FORAGE-SAMPLE DRYER. Jour. Range Mangt. 17: 88-89, illus.
An inexpensive, large-capacity dryer, constructed by connecting a forced-air heating unit to an insulated chamber, brings forage to constant weight in 48 hours at 60°C.

Schuster, J. L., and Halls, L. K.
1963. Timber overstory determines deer forage in shortleaf-loblolly pine-hardwood forests. Soc. Amer. Foresters Proc. 1962: 165-167, illus.
Timber stands cut by the shelterwood method developed a high hardwood midstory that suppressed forage plants; under selection cutting the midstory was lower and forage more abundant.

▼SCHUSTER, J. L., AND WASSER, C. H.
1964. NAIL-BOARD METHOD OF ROOT SAMPLING. Jour. Range Mangt. 17: 85-87, illus.
Soil monoliths containing root samples are excavated in a nail-studded frame. The nails retain the roots in their natural positions while the soil is washed away.

STERNITZKE, H. S., and HALLS, L. K.
1962. FOREST GRAZING IN THE ARKANSAS OZARKS. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 141.
About 23 percent of the forest land in the region is grazed by cattle.

WHITAKER, L. B., PEARSON, H. A., AND MONROE, W. M.
1970. CROSSBRED CATTLE—CUSTOM-BUILT FOR PINEY WOODS RANGE. La. Cattleman 70(9): 8-9.
A Brahman-Jersey crossbred cow on longleaf pine-bluestem range in central Louisiana produced calves in 14 consecutive years.

WOLTERS, G. L.
1970. BREAKING DORMANCY OF LONGLEAF UNIOLA SEEDS. J. Range Manage. 23: 178-180.
Both speed and completeness of germination were raised to acceptable levels by prechilling caryopses at 2° C. for 4 to 6 weeks, then germinating them in constant darkness with alternating temperatures of 20 and 40° C.

WILDLIFE

BLAIR, R. M.
1967. DEER FORAGE IN A LOBLOLLY PINE PLANTATION. J. Wildlife Manage. 31: 432-437.
When the plantation was young, browse yields were in direct proportion to the amount of pine removed in thinnings. By age 35 a hardwood midstory was suppressing the understory, and browse yields were best in stands that had been thinned lightly.

▼BLAIR, R. M.
1968. KEEP FORAGE LOW TO IMPROVE DEER HABITAT. Forest Farmer 27(11): 8-9, 22-23.
Loblolly pine plantations being managed for timber will afford good deer habitat if hardwood midstories are prevented from developing.

BLAIR, R. M.
1969. TIMBER STAND DENSITY INFLUENCES FOOD AND COVER. *In* The white-tailed deer in the southern forest habitat. Proc. Symp. Nacogdoches, Tex. USDA Forest Serv. South. Forest Exp. Sta.
Growing timber at a minimum density that will yield an acceptable economic return can increase light penetration to the understory, thus improving the growth of food and cover vegetation.

BLAIR, R. M., and BRUNETT, LOUIS.
1962. PINEY WOODS DEER RESEARCH. La. Conserv. 14 (2): 18-19, illus.
The Louisiana Wild Life and Fisheries Commission and the U. S. Forest Service are cooperatively studying the deer carrying capacity of well-stocked loblolly-shortleaf pine forests.

BLAIR, R. M., AND EPPS, E. A., JR.
1967. DISTRIBUTION OF PROTEIN AND PHOSPHORUS IN SPRING GROWTH OF RUSTY BLACKHAW. J. Wildlife Manage. 31: 188-190, illus.
Spring growth contained more crude protein and phosphorus in the terminal inch of twigs and leaves than in segments 2 and 3 inches from the tip.

BLAIR, R. M., AND EPPS, E. A., JR.
1969. SEASONAL DISTRIBUTION OF NUTRIENTS IN PLANTS OF SEVEN BROWSE SPECIES IN LOUISIANA. USDA Forest Serv. Res. Pap. SO-51, 35 pp.
Contents of dry matter, protein, ether extract, crude fiber, nitrogen-free extract, ash, calcium, and phosphorus were determined for 2 years in leaves and twigs. Species studied were American beautyberry, sweetgum, blackgum, common greenbrier, yellow jessamine, loblolly pine, and common sweetleaf.

BLAIR, R. M., AND HALLS, L. K.
1968. GROWTH AND FORAGE QUALITY OF FOUR SOUTHERN BROWSE SPECIES. Southeast. Assoc. Game and Fish Comm. 21st Annu. Conf. Proc. 1967: 57-62.
In yellow jessamine, rusty blackhaw, yaupon, and common greenbrier, protein and phosphorus contents of leaves and twigs were highest during the period of rapid growth in early spring.

▼Blair, R. M., Hays, J. A., and Brunett, Louis.
1963. Stream-crossing structure for deer fence. Jour. Wildlife Mangt. 27: 129-132, illus.
Construction details.

▼CRAWFORD, H. S., AND LEONARD, R. G.
1965. THE SYLAMORE DEER STUDY. Southeastern Assoc. Game and Fish Commissioners Seventeenth Ann. Conf. Proc., pp. 9-13.
A study of the effects of forest management systems on deer carrying capacity in the Arkansas Ozarks has been established in two large enclosures.

▼HALLS, L. K.
1962. WILDLIFE HABITAT RESEARCH IN THE MID-SOUTH. Forest Farmer 21(13): 6-7, 14-17, illus.
Similar to MORE GAME, AND TIMBER TOO!, *listed below under Southern Forest Experiment Station.*

HALLS, L. K.
1966. SEASONAL GROWTH OF DEER-BROWSE PLANTS. Proc., X Int. Grassland Congr., pp. 987-990, illus.
Among 15 important deer-browse species in a pine-hardwood forest of eastern Texas, 12 made rapid twig growth in spring and then practically ceased growing. A few responded to rain and grew at intervals through the summer, and 2 continued into fall.

HALLS, L. K., editor.
1969. WHITE-TAILED DEER IN THE SOUTHERN FOREST

HABITAT. Proc. Symp. Nacogdoches, Tex., 130 p. USDA Forest Serv. S. Forest Exp. Sta.

Twenty-nine papers, comprising a compendium of the most recent information on the subject.

HALLS, L. K.

1970. GROWING DEER FOOD AMIDST SOUTHERN TIMBER. J. Range Manage. 23: 213-215.

Food yields, and thus deer populations, are governed by timber stand density, frequency of timber cuttings, size and distribution of cutting units, and application of prescribed burning.

▼HALLS, L. K.

1970. NUTRIENT REQUIREMENTS OF LIVESTOCK AND GAME. *In* Range and wildlife habitat evaluation—a research symposium, p. 10-18. USDA Misc. Pub. 1147.

Review of literature.

HALLS, L. K., AND ALCANIZ, RENE.

1965. ROOTING CUTTINGS OF BROWSE PLANTS. U. S. Forest Serv. Res. Note SO-25, 2 pp.

In a greenhouse, stem cuttings from American beautyberry, flowering dogwood, black willow, and common greenbrier rooted consistently enough to warrant recommendation for vegetative propagation. Rooting of 11 other species was erratic or poor.

HALLS, L. K., AND ALCANIZ, RENE.

1965. SEASONAL TWIG GROWTH OF SOUTHERN BROWSE PLANTS. U. S. Forest Serv. Res. Note SO-23, 5 pp., illus.

After rapid growth in spring, twig elongation practically ceased for 12 of 16 browse species. A few species responded to increased moisture and grew through the summer, and two continued into fall. Most vines died back somewhat in late summer and fall. Five species fruited in summer, others in fall.

▼HALLS, L. K., AND ALCANIZ, RENE.

1968. BROWSE PLANTS YIELD BEST IN FOREST OPENINGS. J. Wildlife Manage. 32: 185-186.

At age 5 years, open-grown plants of seven browse species averaged 32 times more fruit and nearly seven times more twig growth than plants beneath a sawtimber-size stand of southern pines.

▼HALLS, L. K., BOYD, C. E., LAY, D. W., AND GOODRUM, P. D.

1965. DEER FENCE CONSTRUCTION AND COSTS. J. Wildlife Manage. 29: 885-888, illus.

Two 153-acre deer pens, consisting of 4.4 miles of boundary fence 8½ feet high and 0.8 mile of fenced ¼-acre exclosures, were constructed for $16,429: $6,816 for labor and right-of-way clearing and $9,613 for materials.

HALLS, L. K., AND EPPS, E. A., JR.

1969. BROWSE QUALITY INFLUENCED BY TREE OVERSTORY IN THE SOUTH. J. Wildlife Manage. 33: 1028-1031.

Browse plants grown in the open usually contained more crude protein and phosphorus but less crude fiber than plants beneath pines. Leaves had more crude protein, phosphorus, and calcium than stems, but were lower in crude fiber.

HALLS, L. K., AND HOMESLEY, W. B.

1966. STAND COMPOSITION IN A MATURE PINE-HARDWOOD FOREST OF SOUTHEASTERN TEXAS. J. Forest. 64: 170-174, illus.

After protection from fire and cutting for 25 years, the 70-year-old forest is evolving into an oak-hickory-sweetgum community. Hardwoods form an almost complete cover beneath the now dominant pines. Pine reproduction is virtually lacking. Desirable deer browse plants are prevalent, but many are beyond reach. High-value livestock forage species are scarce.

HALLS, L. K., LAY, D. W., BOYD, C. E., AND GOODRUM, P. D.

1964. HIGH HOPES FOR HARDWOODS. Tex. Game and Fish 22(11): 4-5, 21, illus.

Cooperative research to define the importance of hardwoods in deer and squirrel habitat is under way near Nacogdoches, Texas.

HALLS, L. K., MCCARTY, J. D., AND WIANT, H. V.

1970. RELATIVE BROWSING OF 16 SPECIES BY WHITE-TAILED DEER. J. Range Manage. 23: 146-147.

In a pine-hardwood forest of east Texas, winged elm was eaten most in spring. Alabama supplejack was palatable from spring through fall, and saw greenbrier was eaten all year. Though plentiful, flowering dogwood, grape, poison-ivy, and rusty blackhaw were used lightly. American beautyberry was browsed mainly in fall. Yellow jessamine was eaten more than any other browse species during winter.

HALLS, L. K., AND OEFINGER, S. W., JR.

1968. A VOTE FOR YAUPON. La. Conserv. 20(7&8): 6-7.

Ilex vomitoria *is a valuable game food plant.*

▼HALLS, L. K., AND OEFINGER, S. W., JR.

1968. RESEARCH TO GROW GAME WITH OUR TIMBER. USDA Forest Serv. Southern Forest Exp. Sta., 25 pp.

At Nacogdoches, Texas, the Southern Forest Experiment Station is studying ways of producing an abundance of deer, squirrel, quail, and turkey in the commercial forests of the South.

HALLS, L. K., AND OEFINGER, S. W., JR.

1969. AMERICAN BEAUTYBERRY VALUABLE GAME FOOD PLANT. La. Conserv. 21 (1&2): 23-24.

The twigs, leaves, and berries are food for wildlife of many kinds.

▼HALLS, L. K., AND OEFINGER, S. W., JR.

1969. CAROLINA JESSAMINE. La. Conserv. 21(11&12): 22-23.

This evergreen woody vine is important as deer browse in winter.

HALLS, L. K., AND OEFINGER, S. W., JR.

1969. FLOWERING DOGWOOD. La. Conserv. 21(5&6): 5.

Turkeys, squirrels, and deer eat the fruit, and deer also take the leaves and twigs, which have a high calcium content.

HALLS, L. K., AND OEFINGER, S. W., JR.
1969. HONEYSUCKLE HEAVEN. La. Conserv. 21(3&4): 5.
Honeysuckle patches provide food and cover for a variety of wildlife.

HALLS, L. K., PERKINS, C. J., AND TURK, J.
1970. SEEDED LEGUMES REPRODUCE POORLY ON CUTOVER LONGLEAF PINELANDS. USDA Forest Serv. Res. Note SO-105, 5 p.
A combination of disking, fertilizing, and seeding was best for establishing partridge-pea, wild sensitive plant, and common lespedeza on cutover longleaf pinelands in southern Alabama. Common lespedeza seedings were most successful and partridge-pea the least. Number of plants and seed pods declined so rapidly after the first year that seeding these legumes to increase the food supply for game birds is probably not practical.

▼ HALLS, L. K., AND STRANSKY, J. J.
1964. WILDLIFE HABITAT AND SILVICULTURE LAB AT DOCHES. Tex. Forests and Texans 5(3): 10, 20, illus.
The laboratory, established at Nacogdoches, Texas, in 1945, is studying timber management and wildlife habitat. It has also done research on forest insects.

HALLS, L. K., AND STRANSKY, J. J.
1968. GAME FOOD PLANTINGS IN SOUTHERN FORESTS. Thirty-third N. Amer. Wildlife and Nat. Resources Conf. Proc. 1968: 217-222.
In the present state of knowledge, plantings cannot be either generally recommended or generally discouraged.

MILLER, H. A., AND HALLS, L. K.
1969. FLESHY FUNGI COMMONLY EATEN BY WILDLIFE. USDA Forest Serv. Res. Pap. SO-49, 27 pp.
Purpose of this guide is to aid in identification of 58 species of mushrooms commonly eaten by wildlife in the Southeast.

NEWSOM, J. D., SHORT, H. L., FOWLER, J. F., AND MCCOY, G. L.
1968. STUDY SHOWS EFFECTS OF NUTRITION ON GROWTH OF DEER. La. Agr. 12(1): 4-5.
Penned deer with unlimited access to a balanced ration outperformed deer on a ration formulated to compare with natural foods eaten in the pine-hardwood forests of Louisiana.

NIXON, E. S., AND HALLS, L. K.
1970. RESPONSE OF PARTRIDGEPEA TO SOIL FACTORS. *In* Twenty-third Annu. Southeast. Assoc. Game and Fish Comm. Conf. Proc. 1970: 26-30.
Growth was better on Kalmia than on Houston, Rains, and Tifton soils.

▼ OEFINGER, S. W., AND HALLS, L. K.
1970. GREENBRIERS FOR WILDLIFE. La. Conserv. 22 (1 & 2): 23-25.
These vines are nutritious for deer in spring. Some species keep their leaves long enough to provide maintenance forage in early winter, when food is usually scarce.

▼ RIPLEY, T. H., AND HALLS, L. K.
1966. MEASURING THE FOREST WILDLIFE RESOURCE. *In* Measuring the Southern Forest, pp. 163-184. La. State Univ. 15th Annu. Forest. Symp. Proc. 1966. La. State Univ. Press.
Summarizes chief methods of measuring yields of forage and fruit, estimating utilization, and censusing game populations.

▼ SCHUSTER, J. L.
1965. ESTIMATING BROWSE FROM TWIG AND STEM MEASUREMENTS. J. Range Manage. 18: 220-222.
In upland forests of east Texas, total twig length was closely correlated with yield of deer browse plants, but the best predictor of yields was a combination of twig numbers and length.

SEGELQUIST, C. A.
1966. SEXING WHITE-TAILED DEER EMBRYOS BY CHROMATIN. J. Wildlife Manage. 30: 414-417, illus.
Sex chromatin particles were found in nuclei of extra-embryonic membranes of female embryos, but were absent from males.

SEGELQUIST, C. A., AND GREEN, W. E.
1968. DEER FOOD YIELDS IN FOUR OZARK FOREST TYPES. J. Wildlife Manage. 32: 330-337.
Cedar glades and bottom-land hardwoods yielded the most herbage and evergreen browse, and received heaviest use when mast was scarce. Upland hardwood types grew less forage but were the main source of winter food in good mast years. Mast yields averaged 5 to 10 times greater than winter browse yields.

SEGELQUIST, C. A., AND HALLS, L. K.
1967. HISTORY AND STATUS OF FOREST GAME HABITAT RESEARCH IN THE SOUTH. Southeast. Assoc. Game and Fish Commissioners 20th Annu. Conf. Proc. 1966: 1-5.
A total of about 15 professional man-years of research are now expended annually by all active agencies: by no means enough, but still triple the effort that was being made a decade ago.

SEGELQUIST, C. A., AND PENNINGTON, R. E.
1968. DEER BROWSE IN THE OUACHITA FOREST IN OKLAHOMA. J. Wildlife Manage. 32: 623-626.
Winter yields of browse averaged 19 pounds per acre, of which 14 pounds were preferred. Such low yields may be limiting deer populations on the forest.

SEGELQUIST, C. A., WARD, F. D., AND LEONARD, R. G.
1969. HABITAT-DEER RELATIONS IN TWO OZARK ENCLOSURES. J. Wildlife Manage. 33: 511-520.
In a 600-acre enclosure in Arkansas, severe mortality of white-tailed deer occurred during the two winters out of five when mast yields were low. In a companion enclosure where forage and mast

were more plentiful, deer losses were lower and never exceeded production.

SHORT, H. L.
1966. EFFECTS OF CELLULOSE LEVELS ON THE APPARENT DIGESTIBILITY OF FEEDS EATEN BY MULE DEER. J. Wildlife Manage. 30: 163-167.
Digestible energy and dry matter of feed materials was inversely related to the cellulose content.

SHORT, H. L.
1966. METHODS FOR EVALUATING FORAGES FOR WILD RUMINANTS. Trans. 31st North Amer. Wildlife and Natur. Resources Conf., pp. 122-128.
Rumen assays are more versatile in evaluating forages or habitats than are feeding-performance experiments or digestion trials.

SHORT, H. L.
1967. FORAGE ANALYSES FOR DEER MANAGEMENT STUDIES. Southeast. Assoc. Game and Fish Commissioners 20th Annu. Conf. Proc. 1966: 15-18.
Summarizes methods for chemically analyzing plant tissue and procedures for processing plant samples.

SHORT, H. L.
1969. PHYSIOLOGY AND NUTRITION OF DEER IN SOUTHERN UPLAND FORESTS. *In* The white-tailed deer in the southern forest habitat. Proc. Symp. Nacogdoches, Tex. USDA Forest Serv. South. Forest Exp. Sta.
The forests generally are on infertile soils and produce roughages that are seasonally deficient in net energy, protein, and phosphorus.

▼ SHORT, H. L.
1970. DIGESTIBILITY TRIALS: IN VIVO TECHNIQUES. *In* Range and wildlife habitat evaluation—a research symposium, p. 79-84. USDA Misc. Pub. 1147.
Review of methods for measuring digestion in living herbivores.

SHORT, H. L., DIETZ, D. R., AND REMMENGA, E. E.
1966. SELECTED NUTRIENTS IN MULE DEER BROWSE PLANTS. Ecology 47: 222-229, illus.
For deciduous species the dry matter, crude fat, and caloric content were seasonally high in autumn-winter; beta carotene, crude protein, and several minerals were high in spring-summer. For evergreen species such trends were much less pronounced.

SHORT, H. L., AND GOLLEY, F. B.
1968. METABOLISM. *In* A practical guide to the study of the productivity of large herbivores, pp. 95-105. Int. Biol. Programme Handbook 7.
Reviews methods for measuring metabolism and food utilization in large herbivores, and for determining energy requirements under various conditions.

SHORT, H. L., AND HARRELL, A.
1969. NUTRIENT ANALYSIS OF TWO BROWSE SPECIES. J. Range Manage. 22: 40-43.
The species were American beautyberry and rusty blackhaw. Levels of protein, nitrogen-free extract, and cell contents were highest in spring, and new twigs contained more than old twigs. Leaves, particularly of beautyberry, were more nutritious than twigs or fruit.

SHORT, H. L., MEDIN, D. E., AND ANDERSON, A. E.
1965. RUMINORETICULAR CHARACTERISTICS OF MULE DEER. J. Mammal. 46: 196-199.
Volume of the rumen-reticulum is about 10 percent of body weight, and contents and dry matter are about 7.4 and 1 percent of body weight. These proportions are smaller than for domestic cows.

SHORT, H. L., MEDIN, D. E., AND ANDERSON, A. E.
1966. SEASONAL VARIATIONS IN VOLATILE FATTY ACIDS IN THE RUMEN OF MULE DEER. J. Wildlife Manage. 30: 466-470, illus.
Changes in composition of the acids suggested an increased fermentation rate during summer, when range forage is succulent.

SHORT, H. L., NEWSOM, J. D., MCCOY, G. L., AND FOWLER, J. F.
1969. EFFECTS OF NUTRITION AND CLIMATE ON SOUTHERN DEER. Thirty-Fourth N. Amer. Wildlife and Nat. Resources Conf. Trans. 1969: 137-145.
A diet deficient in protein and minerals is probably the major cause for the small size and low population density of white-tailed deer in upland forests of the South. High summer temperatures may also be detrimental.

SHORT, H. L., AND REAGOR, J. C.
1970. CELL WALL DIGESTIBILITY AFFECTS FORAGE VALUE OF WOODY TWIGS. J. Wildl. Manage. 34: 964-967.
Mule deer appear able to digest almost all of the cell contents of woody twigs, but digestion of cell wall constituents is limited.

SHORT, H. L., AND REMMENGA, E. E.
1965. USE OF FECAL CELLULOSE TO ESTIMATE PLANT TISSUE EATEN BY DEER. J. Range Manage. 18: 139-144.
Cellulose content of forages was inversely related to digestible energy of the ration. In pen trials, fecal cellulose seemed to be an indicator of range forage consumed.

SHORT, H. L., REMMENGA, E. E., AND BOYD, C. E.
1969. VARIATIONS IN RUMINORETICULAR CONTENTS OF WHITE-TAILED DEER. J. Wildlife Manage. 33: 187-191.
Among 68 deer killed in east Texas during late autumn, males had a smaller rumen fill than females, and lactating females a slightly greater fill than all other deer.

SHORT, H. L., SEGELQUIST, C. A. GOODRUM, P. D., AND BOYD, C. E.
1969. RUMINO-RETICULAR CHARACTERISTICS OF DEER ON FOOD OF TWO TYPES. J. Wildlife Manage. 33: 380-383.
Microbial activity within the rumen-reticulum was greater for deer eating mainly

acorns than for those eating mainly grasses and browse.

▼Southern Forest Experiment Station.
1962. more game, and timber too! U. S. Forest Serv. South. Forest Expt. Sta., 16 pp., illus.
General description of the Southern Forest Experiment Station's wildlife habitat research program. Research is concentrated in, but not confined to, Coastal Plain forests of loblolly and shortleaf pine and hardwoods.

▼Stransky, J. J.
1968. timber and quail—dual forest crops. 1967 Annu. Meeting, Tex. Chapter, Soc. Amer. Forest. Proc., 5 pp.
In the southern Coastal Plain, pine timber and quail can be managed together without serious conflict.

Stransky, J. J.
1969. deer habitat quality of major forest types in the south. *In* The white-tailed deer in the southern forest habitat. Proc. Symp. Nacogdoches, Tex. USDA Forest Serv. South. Forest Exp. Sta.
The four major forest types differ widely in carrying capacity. Bottom-land hardwoods are the best deer habitats, followed by the shortleaf-lobolly pine hardwood type, the upland hardwood type, and the longleaf-slash pine type.

Stransky, J. J., and Halls, L. K.
1967. timber and game relations in pine-hardwood forests of the southern united states. *In* 14th Congr. Proc., Int. Union Forest. Res. Organ. Vol. 7: 208-217, illus.
Suggests means of improving game food supplies in forests being managed intensively for timber.

Stransky, J. J., and Halls, L. K.
1968. woodland management trends that affect game in coastal plain forest types. Southeast. Assoc. Game and Fish Comm. 21st Annu. Conf. Proc. 1967: 104-108.
Game production, although closely governed by forest types, will be influenced by intensive timber management practices. Some of these are favorable to game, while others are not.

▼Stransky, J. J., and Halls, L. K.
1969. small forest holdings could be combined for hunting leases. Twenty-Second Annu. Conf. Southeast. Assoc. Game and Fish Comm. Proc. 1968: 125-128. *Also in* What's new in forestry—1969, pp. 14-15. Second Sess. Symp. at S.F. Austin State Univ. Special issue, Consultant.
Most forest acreage in the South is in small holdings. Much-needed hunting land, and income for rural landowners, could be provided by combining small forest holdings into large units and leasing the hunting rights.

▼Ward, F., and Segelquist, C.
1969. the sylamore deer study. Ark. Game and Fish 2(2): 10-14.
In Ozark forests that supply limited amounts of green forage and woody browse, carrying capacity in years of mast failure is about one deer per 60 acres. Where cedar glades and streambottom types contribute substantial green forage in winter, carrying capacity is about one deer per 30 acres.

▼Wiant, H. V., Jr., and Oefinger, S. W., Jr.
1969. mounting twig specimens. J. Forest. 67: 254.
A reference collection of deciduous twigs can be prepared as a looseleaf notebook, with twigs mounted in slots cut in pages of posterboard.

SOILS AND SITE

▼Andrew, L. E., and Stearns, F. W.
1963. Physical characteristics of four Mississippi soils. Soil Sci. Soc. Amer. Proc. 27: 693-697, illus.
Mean values of 12 properties reflected the field physiographic grouping of these silt loams into upland, including Memphis and Loring, and bottom land, including Falaya and Collins. Clay content was most definitive in this respect and proved the best single key to values of other properties.

▼Bassett, J. R.
1963. Influence of soil properties on site index of pine. La. Assoc. Agronomists Proc. 3: 30-37.
Site properties that have been studied most and are understood best are related to physical soil factors, particularly those affecting water-holding capacity and root development.

Bassett, J. R., and Beene, J. T.
1967. loblolly pine site quality of four loess soils. U. S. Forest Serv. Res. Note SO-68, 6 pp., illus.
On modal Loring, Grenada, Calloway, and Henry soils in northeastern Louisiana and southeastern Arkansas, mean site index differed between soils but declined northward on all soils at the rate of 1.2 feet per township.

Bassett, J. R., and McDaniel, A. R.
1967. trafficability of four loess soils. soil sci. soc. amer. proc. 31: 115-117, illus.
Strength of the 15- to 30-cm. layer of 65 modal sites on Loring, Grenada, Calloway, and Henry silt loams varied as much within series as between. Thus, little accuracy of strength prediction was lost by grouping the series for trafficability purposes.

▼Bassett, J. R., McDaniel, A. R., and Knight, S. J.
1966. variation in trafficability of four loess soils. U. S. Army Eng. Waterways Exp. Sta. Misc. Pap. 4-838, 17 + pp., illus.
In computations of trafficability, Loring, Grenada, Calloway, and Henry silt loams can be grouped with little loss in accuracy.

Bilan, M. V., and Stransky, J. J.
1966. pine seedling survival and growth response to soils of the texas post-oak belt. S. F. Austin State Coll. Forest. Bull. 12, 21 pp., illus.
In a greenhouse test, seedling survival was about the same in all soils, but seedlings grew best in a soil from the pine belt (control) and in Cuthbert stony sandy loam from the post oak belt. Growth was inferior in two other post oak soils, Lakeland fine sand and the heavy clay subsoil of Axtell fine sandy loam.

Blackmon, B. G., and Broadfoot, W. M.
1969. lime, fertilizer cottonwood tests. Miss. Farm Res. 32(7): 6, 8.
In greenhouse tests, fertilizer increased growth of eastern cottonwood seedlings on Commerce and Bibb soils, but not on Sharkey or Adler. Liming produced large growth increases on Bibb.

Blackmon, B. G., and Broadfoot, W. M.
1970. fertilizer improves poplar growth. Miss. Farm Res. 33(11): 7.
Application of complete fertilizers may make eroded soils in the silty uplands of Mississippi suitable for planting yellow-poplar.

▼Bonner, F. T., and Broadfoot, W. M.
1964. soil nutrients and ph in southern hardwood nurseries. Region 8 Forest Nurserymen's Conferences Proc. 1964: 125-127. U. S. Forest Serv. South. Region.
The pH must be 7.0 or less for southern oaks, tupelos, and yellow-poplar. Cottonwood, sycamore, pecan, and silver maple can be grown on alkaline soils.

Bonner, F. T., and Ralston, C. W.
1968. oxidation-reduction potential of saturated forest soils. Soil Sci. Soc. Amer. Proc. 32: 111-112.
In an environment favorable to soil microorganisms—high temperature and adequate nutrients—large negative changes in redox potentials occurred under anaerobic conditions.

Bower, D. R.
1962. removing understory hardwoods from pine stands impairs moisture relations. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 141.
A decline in weight and moisture-holding capacity of litter-humus and an increase in evaporation from the surface layer of soil followed removal of understory hardwoods in the Ouachita Mountains.

Bower, D. R.
1966. surface soil recovers quickly after burn. U. S. Forest Serv. Res. Note SO-46, 2 pp.
Prescribed burns in the Ouachita Mountains of Arkansas temporarily increased bulk density and reduced surface-soil aggregation, but the detrimental effects disappeared within 4 years.

Boyer, W. D., and Fahnestock, G. R.
1966. litter in longleaf pine stands thinned to prescribed densities. U. S. Forest Serv. Res. Note SO-31, 4 pp., illus.
At densities of 10 to 50 square feet of basal area per acre, longleaf pine stands produced 900 to 3,000 pounds of litter per acre annually. Total litter accumulation was always less than the amount deposited in 2 years.

Brendemuehl, R. H.
1967. loss of topsoil slows slash pine seedling growth in florida sandhills. U. S. Forest Serv. Res. Note SO-53, 4 pp., illus.
Seedlings grown in pots for 9 to 18 months were significantly affected by treatments equivalent to removing 0 to 6 inches of the normal soil profile before the trees were planted. Growth differences were correlated with the nitrogen and organic-matter content of the soil.

Broadfoot, W. M.
1962. the fame of sharkey clay. Forests and People 12(1): 30, 40, illus.
Sharkey is sticky when wet, but dries into hard granules. Because it contains montmorillonite, it can absorb huge amounts of water; when it dries it develops exceptionally wide, deep cracks. Though only moderately productive, Sharkey supports much of the hardwood forest of the Mississippi Delta.

Broadfoot, W. M.
1963. Guide for evaluating water oak sites. U. S. Forest Serv. Res. Paper SO-1, 8 pp., illus. South. Forest Expt. Sta., New Orleans, La.
Site index can be gaged by 3 methods: (1) estimated from amount of sodium in the soil, depth of topsoil, and presence or absence of of a hardpan; (2) determined in the field from soil texture, depth to mottling, presence of a pan, depth of topsoil, and inherent moisture condition; (3) read from a table of averages after soil series and phase have been identified.

Broadfoot, W. M.
1964. guide for evaluating willow oak sites. U. S. Forest Serv. Res. Paper SO-13, 7 pp., illus.
Site index can be estimated by three methods. The most precise requires determination of clay content in the 36- to 48-inch layer, depth to mottling, inherent moisture condition, and presence or absence of hardpan.

Broadfoot, W. M.
1964. soil suitability for hardwoods in the midsouth. U. S. Forest Serv. Res. Note SO-10, 10 pp., illus.
Tables depict suitability relations for the five major soil areas.

Broadfoot, W. M.
1969. problems in relating soil to site index for southern hardwoods. Forest Sci. 15: 354-364.
Various soil-site characters were correlated with height growth of sweetgum, eastern cottonwood, green ash, willow oak, water oak, cherrybark oak, and Nuttall oak, but equations developed by multiple regression do not accurately predict site index of new populations over large areas.

▼Broadfoot, W. M.
1970. tree-character relations in southern hardwood stands. USDA Forest Serv. Res. Note SO-98, 7 p.
Site index and other characters of sweetgum are compared with those of green ash, eastern cottonwood, and cherrybark, Nuttall, water, and willow oaks growing close to and of the same age as the sweetgums.

Broadfoot, W. M., and Bonner, F. T.
1966. soil compaction slows early growth of planted cottonwood. U. S. Forest Serv. Tree Planters' Notes 79, pp. 13-14.
Growth of cuttings is considerably retarded in sandy loam soil compacted to a bulk density of 1.60.

Broadfoot, W. M., and Ike, A. F.
1968. research progress in fertilizing southern hardwoods. *In* Forest fertilization—theory and practice, pp. 180-184. TVA Nat. Fert. Develop. Center, Muscle Shoals, Ala.
Fertilizing stimulated growth of eastern cottonwood, sweetgum, water and willow oak, yellow-poplar, and sycamore. In most cases, N appeared to be the key element.

▼Broadfoot, W. M., and McKnight, J. S.
1962. soil suitability for hardwoods in coastal plains. Miss. Farm Res. 25(2): 6. *Also as* Miss. Agr. Expt. Sta. Inform. Sheet 745, 2 pp.
Tabular summary of suitability of soils in this land resource area for growing about 30 commercial hardwood species.

▼Broadfoot, W. M., and McKnight, J. S.
1962. soil suitability for hardwoods in the blackland area. Miss. Farm Res. 25(11): 3. *Also as* Miss. Agr. Expt. Sta. Inform. Sheet 783, 2 pp.
See abstract above.

Burns, R. M.
1968. sand pine: a tree for west florida's sandhills. J. Forest. 66: 561-562.
In a 12-year-old plantation, sand pines of the Ocala race grew larger, but those of the Choctawhatchee race survived better and appeared better adapted to the soil. Shortleaf, Virginia, loblolly, and longleaf pines competed poorly.

Burton, J. D., Guenther, W. B., and Owen, H. M.
1964. profile of natural radioactivity in hartsells loam. Soil Sci. Soc. Amer. Proc. 28: 500-501.
Radioactivity varied with total potassium content and was more closely related to total fines than to clay content.

Covell, R. R., and McClurkin, D. C.
1967. site index of loblolly pine on ruston soils in the southern coastal plain. J. Forest. 65: 263-264, illus.
Site index may be closely predicted from April-through-September rainfall and thickness of topsoil.

Craul, P. J.
1968. longleaf pine site index poorly correlated with soil type in southern alabama. USDA Forest Serv. Res. Note SO-74, 2 pp.
On a 3,000-acre area, variation of site index within nine soil types was so large that differences in the means by soil type were significant only for the two extremes.

▼Eneim, R. C., and Watterston, K. G.
1970. pine seedling survival and growth related to moisture retention of eight texas forest soils. USDA Forest Serv. Tree Plant. Notes 21(1): 12, 17-20.
Though many soils of the east Texas pine type and the oak-hickory region are suitable for pine establishment, moisture-retention characteristics should be investigated to determine potential survival and development of planting stock and the requirements for site preparation.

▼Ferguson, E. R., and Graney, D. L.
1970. exposing profiles on forested mountain soils with a backhoe. J. Soil & Water Conserv. 25: 153-154.
Tractor-mounted backhoes, small enough to be transported on light trucks, have proved efficient for digging soil-classification pits in rocky soils and on steep terrain.

Hodges, J. D., and Lorio, P. L., Jr.
1969. carbohydrate and nitrogen fractions of the inner bark of loblolly pines under moisture stress. Can. J. Bot. 47: 1651-1657.
By comparison with controls, 40-year-old trees subjected to drought showed marked increases in reducing sugars, nonreducing sugars, and total carbohydrates; and an approximately equivalent decrease in starch.

▼Hosner, J. F., and Graney, D. L.
1970. the relative growth of three forest tree species on soils associated with different successional stages in virginia. Amer. Midland Natur. 84: 418-427.
In a greenhouse study, yellow-poplar seedlings grew better on soils from old-field and young pine sites than on soils from mature pine stands and climax hardwood sites. Loblolly pine and Virginia pine seedlings made best height growth on soils from young pine sites.

▼Jorgensen, J. R.
1970. growth and survival of slash pines irrigated by effluents. World Irrig. 20(3):

16-18, 24-25.

Over a 5-year span, applications of strong pulpmill effluents slowed growth and killed some slash pines on soils of the poorly drained Beauregard-Caddo complex.

KRUMBACH, A. W., JR.

1962. POWER SAMPLER FOR FROZEN SOIL. Soil Sci. Soc. Amer. Proc. 26: 209, illus.

A gasoline motor is connected to the sampling tube by a flexible shaft; the spinning tube melts the soil enough to permit ready penetration without injury to the sample core.

▼KRUMBACH, A. W., JR., AND WHITE, D. P.

1964. MOISTURE, PORE SPACE, AND BULK DENSITY CHANGES IN FROZEN SOIL. Soil Sci. Soc. Amer. Proc. 28: 422-425, illus.

In the upper 15 inches of two frozen loam soils, one bare and one under alfalfa, moisture contents usually exceeded prefreeze field maximum. Total pore space was always above that before freezing; bulk density was predominantly less than the lowest expected prefreeze bulk density. Moisture changes in the frozen soils are attributed solely to internal moisture movement.

LORIO, P. L., JR., AND HODGES, J. D.

1968. MICROSITE EFFECTS ON OLEORESIN EXUDATION PRESSURE OF LARGE LOBLOLLY PINES. Ecology 49: 1207-1210.

Daily average OEP was not significantly reduced until severe soil and atmospheric moisture stress occurred in mid-September to mid-October. Then OEP decreased more in trees on flat, usually wet, sites than in trees on low mounds. This response is attributed to a deficient fine-root system on flat sites.

LORIO, P. L., JR., AND HODGES, J. D.

1968. OLEORESIN EXUDATION PRESSURE AND RELATIVE WATER CONTENT OF INNER BARK AS INDICATORS OF MOISTURE STRESS IN LOBLOLLY PINES. Forest Sci. 14: 392-398.

Diurnal patterns of OEP were related to changes in soil and atmospheric moisture, but single early-morning measurements were not closely indicative. Relative water content reflected soil-moisture status and diameter-growth response, and apparently was affected by atmospheric moisture deficit.

McClurkin, D. C.

1963. Soil-site index predictions for white oak in north Mississippi and west Tennessee. Forest Sci. 9: 108-113, illus.

Percent of clay in the surface soil and position on slope were the best indices of site.

MCCLURKIN, D. C.

1965. DIAMETER GROWTH AND PHENOLOGY OF TREES ON SITES WITH HIGH WATER TABLES. U. S. Forest Serv. Res. Note SO-22, 4 pp., illus.

On a site where the water table always was within the root zone, thinning had little effect on diameter growth of white ash or sweetgum but increased the growth of baldcypress. Thinning did not extend duration of growth into the fall, nor was growth related to seasonal fluctuations in the water table. In ash and sweetgum, growth initiation seemed related to soil temperature; in baldcypress, to day length.

MCCLURKIN, D. C., AND COVELL, R. R.

1965. SITE INDEX PREDICTIONS FOR PINES IN MISSISSIPPI. U. S. Forest Serv. Res. Pap. SO-15, 9 pp., illus.

Statistically significant prediction equations have been developed for loblolly pine on 12 soil groups, for shortleaf on 7 groups, and for longleaf on 6.

▼MCKEE, W. H., JR.

1970. CHEMICAL PROPERTIES OF A FOREST SOIL AFFECTED BY FERTILIZATION AND SUBMERGENCE. Soil Sci. Soc. Amer. Proc. 34: 690-693.

Submergence of material from the A-1 horizon of forest soils from the Gulf Coastal Plain markedly increased pH and decreased redox potential. Effects on pH and levels of exchangeable bases remained after the soils were dried. Phosphorus shifted from the A1-P to Fe-P form with submergence. Responses to lime and phosphorus application differed under dry and submerged conditions.

MCKEE, W. H., JR., AND SHOULDERS, E.

1970. DEPTH OF WATER TABLE AND REDOX POTENTIAL OF SOIL AFFECT SLASH PINE GROWTH. Forest Sci. 16: 399-402.

Six-year heights of trees on a wet site were positively correlated with water table depth and redox potential of the soil in winter. Redox potential and depth to water were closely related.

MAPLE, W. R.

1965. FOREST SPECIES COMPARED IN OZARK PLANTATIONS. U. S. Forest Serv. Res. Note SO-28, 2 pp.

Fifteen-year results on abandoned fields indicate that native species should continue to be planted, but that loblolly pine, yellow-poplar, and Virginia pine merit further study.

MOEHRING, D. M., GRANO, C. X, AND BASSETT, J. R.

1966. PROPERTIES OF FORESTED LOESS SOILS AFTER REPEATED PRESCRIBED BURNS. U. S. Forest Serv. Res. Note SO-40, 4 pp., illus.

Nine annual burns have had little effect on the nutrient content and structure of the surface 4 inches of loess soils on flat terrain.

MOEHRING, D. M., AND RALSTON, C. W.

1967. DIAMETER GROWTH OF LOBLOLLY PINE RELATED TO AVAILABLE SOIL MOISTURE AND RATE OF SOIL MOISTURE LOSS. Soil Sci. Soc. Amer. Proc. 31: 560-562, illus.

Growth was related to amount of and weekly rate of change in available soil moisture from June through August. Growth was curtailed whenever soil moisture loss was rapid.

MOEHRING, D. M , AND RAWLS, I. W.

1970. DETRIMENTAL EFFECTS OF WET WEATHER LOG-

GING. J. Forest. 68: 166-167.

Diameter growth of loblolly pine on imperfectly drained silt loam soils in Arkansas was reduced by wet-weather logging in which traffic passed along three or four sides of the tree. Dry-weather logging did not affect growth. Traffic in wet weather increased the soil's bulk density and decreased total pore space and macropore space.

PLASS, W. T., AND BURTON, J. D.

1967. PULPWOOD PRODUCTION POTENTIAL ON STRIP-MINED LAND IN THE SOUTH. J. Soil and Water Conserv. 22: 235-238, illus.

Pine plantations on spoil banks often yield as well as those on abandoned farm lands. The paper industry and the strip miners might well consider a reclamation program for the 185,000 acres of stripped coal lands in the South.

SCHNEIDER, G., AND STRANSKY, J. J.

1966. SOIL MOISTURE AND SOIL TEMPERATURE UNDER A POST OAK-SHORTLEAF PINE STAND. S. F. Austin State Coll. School Forest. Bull. 8, 24 pp., illus.

During 4 years in east Texas, moisture in the upper 18 inches frequently fell below the wilting point during summer. Soil temperatures ranged from 6.1° C. in winter to 28.3° in summer.

▼SMALLEY, G. W.

1964. TOPOGRAPHY, SOIL, AND THE HEIGHT OF PLANTED YELLOW-POPLAR. Jour. Ala. Acad. Sci. 35(2): 39-44, illus.

After 5 years, yellow-poplars planted across upland hollows in north Alabama were tallest in bottoms and decreased in height with position up the slopes.

SMALLEY, G. W.

1967. SOIL-SITE RELATIONS OF UPLAND OAKS IN NORTH ALABAMA. U. S. Forest Serv. Res. Note SO-64, 6 pp., illus.

For white oaks site quality appeared related to slope position (distance from plot center to ridge) and total length of slope. For red oaks, aspect and slope position seemed most important.

SMALLEY, G. W.

1969. TEN-YEAR GROWTH OF YELLOW-POPLAR PLANTED IN NORTH ALABAMA. J. Forest. 67: 567-568.

Ten years after being planted, yellow-poplars on the southern end of the Cumberland Plateau were tallest in moist, well-drained bottoms. Tree height decreased with position up the slope at a greater rate on south than on north slopes. At least 70 percent of the trees survived on all but middle and upper south slopes.

SMITH, J. L.

1962. ROCKY SOIL SAMPLING AND ANALYSES. Jour. Soil and Water Conserv. 17: 71.

In the Ouachita Mountains of Arkansas, undisturbed soil cores were taken from soils having 20 to 75 percent rock volume.

▼STRANSKY, J. J., AND BILAN, M. V.

1964. POWER CUTTER FOR LARGE UNDISTURBED SOIL CORES. Agron. Jour. 56: 363, illus.

The cutter consists of a steel cylinder, 9.5 inches in diameter, with a saw-toothed cutting edge. It is rotated by the post-hole digger attachment of a farm tractor.

STRANSKY, J. J., AND WILSON, D. R.

1967. SOIL MOISTURE AND TEXTURE AFFECT ROOT AND SHOOT WEIGHTS OF TRANSPLANTED PINE SEEDLINGS. U. S. Forest Serv. Res. Note SO-62, 3 pp.

Increasing clay content of soils and repeated droughts inhibited shoot and root development of greenhouse seedlings. Shortleaf pines developed greater root mass than loblolly pines.

WHITE, E. H., AND CARTER, M. C.

1970. PROPERTIES OF ALLUVIAL SOILS SUPPORTING YOUNG STANDS OF EASTERN COTTONWOOD IN ALABAMA. USDA Forest Serv. Res. Note SO-111, 4 p.

Concentrations of P, K, Ca, and Mg generally decreased with depth in the soil profile, while percentages of coarse soil particles increased. Soil K accounted for 94 percent of the variation in tree growth in seven of eight stands studied.

WILLISTON, H. L., AND DICKERSON, B. P.

1968. INFLUENCE OF SITE AND STAND DENSITY ON LOBLOLLY PINE YIELD. Forest Farmer 27(6): 10-11.

Maximum yields are obtained on good sites in relatively dense stands. Heavy thinning reduces total yield but increases the quality of the wood produced.

ZAHNER, ROBERT.

1962. LOBLOLLY PINE SITE CURVES BY SOIL GROUPS. Forest Sci. 8: 104-110, illus.

In southern Arkansas and northern Louisiana significantly different height-age curves were found for 3 groups: loess soils, well-aerated upland soils that are well drained internally and have strong profile development, poorly aerated soils with poor surface or internal drainage.

WATERSHED

▼Bassett, J. R., and Meyer, M. P.
1968. Forecasting trafficability of soils; water table study at Crossett, Arkansas. U. S. Army Eng. Waterways Exp. Sta. Tech. Mem. 3-331, Rep. 9, 103 pp.
A study to evaluate factors affecting heights of water tables and to learn how the Waterways Experiment Station's moisture-prediction method could be modified for improved accuracy on soils with high tables.

▼Bennett, N. C., and McClurkin, D. C.
1964. Water stage recorder wells protected from freezing by homemade candles. Agr. Engin. 45: 330, illus.
Candles made by filling 1-quart cans with paraffin burn for 6 days.

▼Blocker, Wras, and Bower, David.
1963. Filter for sampling sediment in small streams. Jour. Soil and Water Conserv. 18: 222, illus.
Polyethylene foam one-half inch thick is effective.

Bower, D. R., and Smith, J. L.
1962. Seedbed burns in Arkansas mountains compact surface soil. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 139.
In the Ouachitas, cutting a pine stand back to seed trees and burning the site increased volume weight and reduced aggregation of the surface soil.

Dickerson, B. P.
1968. Logging disturbance on erosive sites in north Mississippi. USDA Forest Serv. Res. Note SO-72, 4 pp.
About 1 year after logging was completed, there were signs of accelerated erosion on 3 percent of the area logged for sawtimber and 1 percent of the area on which pulpwood was cut.

Duffy, P. D.
1967. Fertilizing with nitrogen and phosphorus increases loblolly pine foliage production. J. Miss. Acad. Sci. 13: 21-23.
Weight of foliage produced by pot-grown seedlings was doubled by applying large amounts of fertilizer. A given amount of fertilizer was more effective in 10 small doses than in one large dose.

▼Duffy, P. D., and McClurkin, D. C.
1967. Stabilizing gully banks with excelsior mulch and loblolly pine. J. Soil and Water Conserv. 22: 70-71, illus.
Excelsior mats are easily applied and will reduce soil loss for at least 2 years—by which time loblolly seedlings planted when the mats are put down will be firmly established.

▼Fletcher, P. W., and Lull, H. W.
1963. Soil-moisture depletion by a hardwood forest during drouth years. Soil Sci. Soc. Amer. Proc. 27(1): 94-98, illus.
With undisturbed forest soil at field capacity taken as a standard, removal of litter from beneath a Missouri oak-hickory forest speeded soil drying about 10 percent. Removal of trees but not litter decreased drying rates about two-thirds. Removal of both trees and litter decreased rates about one-third.

Lawson, E. R.
1967. Throughfall and stemflow in a pine-hardwood stand in the Ouachita Mountains of Arkansas. Water Resources Res. 3: 731-735, illus.
Throughfall was correlated with gross rainfall and long-term mean temperature on the calendar day of the storm. Stemflow was related to gross rainfall, crown diameter, tree height, and minimum temperature on storm date.

▼Lull, H. W., and Fletcher, P. W.
1962. Comparative influence of hardwood trees, litter, and bare area on soil-moisture regimen. Mo. Agr. Expt. Sta. Res. Bul. 800, 15 pp., illus.
Tree cover increased soil moisture losses, but litter reduced them.

McClurkin, D. C.
1967. Vegetation for erosion control in the southern coastal plain of the United States. Proc., Int. Symp. on Forest Hydrol., pp. 655-660, illus. New York: Pergamon Press.
Loblolly pine is an ideal erosion control plant. It survives well, grows fast, casts more protective litter than other species, and requires little maintenance.

McClurkin, D. C., and Ahlrich, V. E.
1967. Longfingergrass covers bare sites quickly. Crops and Soils 20(3): 18-19, illus.
This bunchgrass, a native of South Africa, survived and grew well on bare, sandy soil in northern Mississippi.

▼Mesavage, Clement, and Smith, J. L.
1962. Soil-erosion gauge. Jour. Soil and Water Conserv. 17: 22, illus.
Construction details of a portable t-shaped frame that can be placed on iron stakes permanently fixed in the soil at points to be sampled. Gauge rods that slide through holes in the main bar can be read to 0.01 inch.

Nelson, T. C.
1967. Limitations on timber harvesting on erosive sites. *In* Harvesting Pine Plantations on Erosive Soils Conf. Proc. 1967: 26-30. Southeast. Area, State and Priv. Forest., U. S. Forest Serv., Atlanta, Ga.
Thinnings are feasible on the erosive sites of the Yazoo watershed, provided that site disturbance is held to a minimum. Clearcutting, except with immediate replanting, would start the erosion cycle again.

Popham, T. W., and Ursic, S. J.
1969. COMPUTER PROGRAM FOR CONVERTING NEUTRON PROBE READINGS TO SOIL WATER EQUIVALENTS. Soil Sci. 107: 302.
Source decks and detailed instructions are available from the Southern Forest Experiment Station.

Rogerson, T. L.
1964. ESTIMATING FOLIAGE ON LOBLOLLY PINE. U. S. Forest Serv. Res. Note SO-16, 3 pp., illus.
Weight of foliage on trees in a 25-year-old plantation in north Mississippi was related to tree diameter. The weight in turn afforded ready estimates of the number of needles and fascicles, whose size and weight were found to be independent of tree diameter.

▼Rogerson, T. L.
1964. LOW-COST RAIN GAGE IMPROVED. Jour. Soil and Water Conserv. 19: 157-158, illus.
Gages made from No. 10 cans measure rainfall accurately. Addition of a second can reduces post-storm evaporation.

Rogerson, T. L.
1967. THROUGHFALL IN POLE-SIZED LOBLOLLY PINE AS AFFECTED BY STAND DENSITY. Proc., Int. Symp. on Forest Hydrol., pp. 187-190, illus. New York: Pergamon Press.
Throughfall in 25-year-old loblolly pine stands was best predicted from rainfall and basal area. In a 2-year study, 99.33 percent of the variation was accounted for by the equation: Throughfall = 0.98 (rainfall) −0.00097 (rainfall × basal area) −0.0184.

Rogerson, T. L.
1968. THINNING INCREASES THROUGHFALL IN LOBLOLLY PINE PLANTATIONS. J. Soil and Water Conserv. 23: 141-142.
In northern Mississippi, where annual rainfall averages 52 inches, reducing stand basal area from 150 to 70 square feet per acre increased throughfall by 4 inches.

Rogerson, T. L.
1970. HALF-MINUTE COUNTS FOR NEUTRON PROBES. Soil Sci. 110: 359-360.
When late-model probe systems are used, half-minute counts are likely to be adequate for most purposes.

Rogerson, T. L., and Byrnes, W. R.
1968. NET RAINFALL UNDER HARDWOODS AND RED PINE IN CENTRAL PENNSYLVANIA. Water Resources Res. 4: 55-57.
Throughfall averaged 80 percent of gross summer precipitation under both hardwoods and pine. Stemflow averaged 2 percent of gross precipitation in hardwoods and 1 percent in pine.

Rogerson, T. L., and Ursic, S. J.
1967. NEW NEUTRON PROBE SYSTEM SPEEDS LOGGING OF SOIL WATER PROFILES. *In* 14th Congr. Proc., Int. Union Forest. Res. Organ. Vol. 1: 416-419, illus.
A probe system incorporating a scintillation detector, a 100-millicurie americium-beryllium source, and a strip-chart recorder offers a threefold increase in productivity over probe-scaler systems, and without loss in precision.

Stephenson, G. K.
1964. RESEARCH TO TAME THE RAIN. U. S. Forest Serv. South. Forest Expt. Sta., 15 pp., illus.
The watershed management research program of the Southern Forest Experiment Station.

Thames, J. L.
1962. LITTER PRODUCTION AS INFLUENCED BY SPECIES OF SOUTHERN PINE. Jour. Forestry 60: 565, illus.
During the first 4 years in erosion-control plantings in north Mississippi, loblolly pine grew faster and produced more litter than shortleaf, Virginia, or west Florida sand pine.

▼Thames, J. L., and Evans, D. D.
1968. AN ANALYSIS OF THE VERTICAL INFILTRATION OF WATER INTO SOIL COLUMNS. Water Resources Res. 4: 817-828.
A new empirical flow equation was obtained by modifying the diffusivity equation for unsaturated flow. Modified, the parameter analogous to soil-water diffusivity becomes a function of both water content and water-content gradient.

Ursic, S. J.
1963. Planting loblolly pine for erosion control in north Mississippi. U. S. Forest Serv. Res. Paper SO-3, 20 pp., illus. South. Forest Expt. Sta., New Orleans, La.
Research-developed methods for planting loblolly pine to stabilize and rehabilitate badly eroded southern uplands—a purpose for which loblolly has no peer.

▼Ursic, S. J.
1963. Planting loblolly pine to stop erosion. Forest Farmer 23(3): 10-12, 16, illus.
See entry above.

Ursic, S. J.
1966. FOREST HYDROLOGY RESEARCH IN MISSISSIPPI. Proc., Mississippi Water Resources Conf. 1966, pp. 98-103. Water Resources Res. Inst., Miss. State Univ.
How to manage forest lands for optimum accretion to ground water is being studied by the Southern Forest Experiment Station's Forest Hydrology Laboratory at Oxford, Mississippi.

Ursic, S. J.
1966. MULCH IMPROVES LOBLOLLY PINE SURVIVAL ON COASTAL PLAIN PARENT MATERIALS. J. Forest. 64: 728-730, illus.
In north Mississippi mulching is worthwhile when planting loblolly pine to stabilize bare gully slopes. On such highly erosive exposures mulch immobilizes soil

around individual seedlings. Spot-mulching trees to a radius of 9 inches is as effective as broadcast applications.

URSIC, S. J.
1967. IMPROVED STANDARDS FOR NEUTRON SOIL WATER METERS. Soil Sci. 104: 323-325.
Economical standards made from polyethylene cylinders 2.5 to 4.5 inches in diameter proved highly satisfactory.

URSIC, S. J.
1967. THE YAZOO-LITTLE TALLAHATCHIE PLANTATIONS AND THEIR ROLE IN WATERSHED PROTECTION. *In* Harvesting Pine Plantations on Erosive Soils Conf. Proc. 1967: 16-20. Southeast. Area, State and Priv. Forest., U. S. Forest Serv., Atlanta, Ga.
The 0.5 million acres of loblolly pine plantations on the Yazoo watershed play a triple hydrologic role by controlling sediment, reducing storm runoff, and augmenting ground-water supplies.

URSIC, S. J.
1968. REFORESTATION AND WATER RESOURCES OF THE YAZOO-LITTLE TALLAHATCHIE WATERSHED. Miss. Water Resources Conf. Proc. 1968: 9-13.
Pine plantations are reducing sedimentation on the watershed and restoring ability of permeable outcrops to accept and store rainfall.

URSIC, S. J.
1969. HYDROLOGIC EFFECTS OF PRESCRIBED BURNING ON ABANDONED FIELDS IN NORTHERN MISSISSIPPI. USDA Forest Serv. Res. Pap. SO-46, 20 pp.
On a small, grass-covered watershed with predominantly well-drained soils, prescribed burning increased stormflows, overland flows, peak discharges, and sediment production for at least 3 years. Identical treatment of a catchment whose soil had a shallow fragipan increased overland flows, peak flows, and sediment production but did not influence stormflow volumes.

URSIC, S. J.
1970. HYDROLOGIC EFFECTS OF PRESCRIBED BURNING AND DEADENING UPLAND HARDWOODS IN NORTHERN MISSISSIPPI. USDA Forest Serv. Res. Pap. SO-54, 15 p.
A winter burn and deadening of hardwoods with herbicide significantly increased stormflows, overland flows, peak discharges, and sediment production from two small watersheds in northern Mississippi. Most of the hydrologic effects were still evident 3 years after the fire.

▼URSIC, S. J., AND DENDY, F. E.
1965. SEDIMENT YIELDS FROM SMALL WATERSHEDS UNDER VARIOUS LAND USES AND FOREST COVERS. *In* Fed. Inter-Agency Sedimentation Conf. Proc. 1963: 47-52, illus. U. S. Dep. Agr. Misc. Pub. 970.
Annual sediment yields and average concentrations of sediment per unit of runoff decreased in the orders corn> pasture> abandoned fields and depleted hardwoods> pine plantations and mature pine-hardwoods. Runoff decreased in the order: corn and pasture> abandoned fields and depleted hardwoods> pine plantations. The watersheds were on hilly uplands of north Mississippi.

URSIC, S. J., AND MCCLURKIN, D. C.
1968. NEW U. S. FOREST SERVICE LABORATORY. Ole Miss Eng. 8(4): 6-7, 10.
A new Forest Hydrology Laboratory at Oxford, Mississippi, provides offices and laboratories for scientists working on watershed problems of the southern Coastal Plain.

URSIC, S. J., AND POPHAM, T. W.
1967. USING RUNOFF EVENTS TO CALIBRATE SMALL FORESTED CATCHMENTS. *In* 14th Congr. Proc., Int. Union Forest. Res. Organ. Vol. 1: 319-324.
Calibration and analysis based on individual runoff events appear efficient for evaluating changes in the hydrologic performance of small paired catchments.

WILLISTON, H. L.
1965. FOREST FLOOR IN LOBLOLLY PINE PLANTATIONS AS RELATED TO STAND CHARACTERISTICS. U. S. Forest Serv. Res. Note SO-26, 3 pp., illus.
At ages 8 to 16 years, erosion-control plantings in north Mississippi had floors whose ovendry weights averaged 7.3 tons per acre. $W = 1.38 + 0.246$ (age) $+ 0.0218$ (basal area).

WILLISTON, H. L.
1967. IMPROVING LOBLOLLY PINE SURVIVAL IN ROADBANK STABILIZATION. U. S. Forest Serv. Tree Planters' Notes 18(3): 18-20, illus.
Planting on roadbanks is highly practicable. Present prescriptions call for spacing of 6 by 6 feet on banks that have been sloped at least 2:1 and stabilized with grass. Survival is better on north than on south aspects, and better when seedlings are planted in post holes than in slits made by planting bars.

DISEASES

TREES

Campbell, W. A., and Verrall, A. F.
1963. Phytophthora cinnamomi associated with Lawson cypress mortality in Louisiana. U. S. Dept. Agr. Plant Dis. Rptr. 47: 808.
The fungus was isolated from dead roots of Chamaecyparis lawsoniana seedlings that had been planted 5 years previously on land once in a tung orchard.

▼Croker, T. C., Jr.
1967. CROP-SEEDLING METHOD FOR PLANNING BROWN-SPOT BURNS IN LONGLEAF PINE. J. For. 65: 488. *Also in* Ala. Forest Prod. 11(7): 63. 1968.
Brown-spot infection and expected fire damage on crop seedlings are better indicators of the need for prescribed burning than are such data taken on average seedlings.

▼Czabator, F. J.
1970. PREVENTING PINE DISEASES. Fifth Forest Insect & Dis. Work Conf. Proc. 1970: 189-191. USDA Forest Serv. State & Priv. Forest. Atlanta, Ga.
Summarizes possibilities of preventing the three important diseases of southern pines: fusiform rust, brown-spot needle blight, and annosus root rot.

Czabator, F. J., and Bailey, R. L.
1970. ELECTRIC PSYCHROMETER FOR REMOTE SENSING AND RECORDING OF RELATIVE HUMIDITY. USDA Plant Dis. Rep. 54: 19-22.
The equipment described senses and records wet- and dry-bulb temperatures in sequence from several locations. A computer program is available for calculating relative humidity from these data and summarizing temperatures and relative humidity throughout a 24-hour period.

Czabator, F. J., and Scott, O. J.
1970. NEW SAMPLER MAKES DISCRETE SPORE PRINTS FOR SPECIFIED TIME INTERVALS. USDA Plant Dis. Rep. 54: 498-500.
The collecting surface is moved at intervals that can be varied from 5 to 60 minutes.

▼ Davidson, R. W., Hinds, T. E., and Toole, E. R.
1964. TWO NEW SPECIES OF CERATOCYSTIS FROM HARDWOODS. Mycologia 56: 793-798, illus.
C. tremulo-aurea *Davidson & Hinds has been isolated from the surface of black cankers on* Populus tremuloides *Michx.; and* C. megalobrunnea *Davidson & Toole from sapwood of* Quercus nuttallii *Palmer.*

Davis, R. T., and Snow, G. A.
1968. WEATHER SYSTEMS RELATED TO FUSIFORM RUST INFECTION. USDA Plant Dis. Reporter 52: 419-422.
Five-day and 30-day prognostic charts can assist weather forecasters in warning nurserymen and foresters of weather favoring infection of southern pines by Cronartium fusiforme.

▼Eleuterius, L. N.
1968. MORPHOLOGY OF CRONARTIUM FUSIFORME IN QUERCUS NIGRA. Phytopathology 58: 1487-1492.
Morphological development from penetration by the infecting hyphae to formation of mature uredia and telia.

▼ Eleuterius, L. N., and Snow, G. A.
1964. CAULICOLOUS TELIA AND UREDIA OF CRONARTIUM FUSIFORME. U. S. Dept. Agr. Plant Dis. Rptr. 48: 366, illus.
Telia and uredia of the rust have been observed on stem tissues of Quercus nigra *L.*

▼Filer, T. H., Jr.
1964. OUTBREAK OF CANKERS ON PLANTATION-GROWN COTTONWOODS IN MISSISSIPPI. U. S. Dept. Agr. Plant Dis. Rptr. 48: 588.
In the spring and early summer of 1963, a basal canker killed tops of many trees in a large young plantation on abandoned farmland. No new infections developed after July, and most top-killed trees resprouted.

▼Filer, T. H., Jr.
1965. SYCAMORE CANKER—PESKY BUT NOT DISASTROUS. Southern Lumberman 211(2632): 169-170, illus.
The canker, caused by Botryodiplodia theobromae *Pat., chiefly attacks trees in low vigor.*

▼Filer, T. H., Jr.
1966. PHLOEM NECROSIS OF AMERICAN ELM IN THE MISSISSIPPI DELTA. U. S. Dep. Agr. Plant Dis. Reporter 50: 751.
The disease appeared in Rolling Fork, Mississippi, in 1966.

Filer, T. H., Jr.
1966. RED THREAD FOUND ON BERMUDA GRASS. U. S. Dep. Agr. Plant Dis. Reporter 50: 525-526, illus.
The red thread fungus, Corticium fuciforme *(Berk.) Wakef., was found on lawns in west-central Mississippi. It had not previously been reported on bermuda grass.*

Filer, T. H., Jr.
1967. DAMPING-OFF OF SWEETGUM BY PYTHIUM SYLVATICUM. Phytopathology 57: 1284.
First report of pathogenicity for this species.

FILER, T. H., JR.

1967. PATHOGENICITY OF CYTOSPORA, PHOMOPSIS, AND HYPOMYCES ON POPULUS DELTOIDES. Phytopathology 57: 978-980, illus.

Cytospora chrysosperma *Fr.*, Phomopsis macrospora *Kobayashi & Chiba, and* Hypomyces solani *(Mart.) Sn. & H. are pathogenic on cottonwood* (Populus deltoides *Bartr.).*

▼FILER, T. H., JR.

1969. CONTROLLING INFECTIOUS DISEASES IN NURSERIES. Southeast. Area Forest Nurserymen's Conf. Proc. 1968: 144-148.

Damping-off, root rots, leaf spots, and fusiform rust can be controlled through careful seedling culture and application of fungicides.

FILER, T. H., JR.

1969. NEW SPECIES OF PTERIDIOSPORA. Mycologia 61: 167-169.

A species isolated from mycorrhizae of sweetgum in northern Mississippi is described and named Pteridiospora spinosispora *Filer.*

FILER, T. H., JR.

1969. SYCAMORE CANKER CAUSED BY BOTRYODIPLODIA THEOBROMAE. Phytopathology 59: 76-78.

The fungus causes cankers on wounded trees in the Lower Mississippi Valley.

FILER, T. H., JR.

1970. VIRULENCE OF THREE CYLINDROCLADIUM SPECIES TO YELLOW-POPLAR SEEDLINGS. USDA Plant Dis. Rep. 54: 320-322.

Cylindrocladium crotalariae *and* C. scoparium *caused severe root rot on potted seedlings.* C. floridanum *caused necrosis only on feeder roots.*

FILER, T. H., JR., AND MCCRACKEN, F. I.

1969. CLITOCYBE TABESCENS ASSOCIATED WITH DECLINE AND DEATH OF CHINESE ELM AND WATER OAK. USDA Plant Dis. Reporter 53: 840.

Sporophores and rhizomorphs were observed, and the fungus was isolated from the root and trunk wood of living trees.

▼FILER, T. H., JR., MCCRACKEN, F. I., AND TOOLE, E. R.

1968. CEPHALOSPORIUM WILT OF ELM IN LOWER MISSISSIPPI VALLEY. USDA Plant Dis. Reporter 52: 170-171.

First report of the wilt from this region.

▼FILER, T. H., AND TOOLE, E. R.

1965. ISOLATIONS FROM MYCORRHIZAL ROOTS OF SWEETGUM. U. S. Dep. Agr. Plant Dis. Reporter 49: 869-870.

Representatives of the Ascomycetes, Basidiomycetes, and Fungi Imperfecti were isolated. No Phycomycetes were isolated, but sporangia and nonseptate mycelium were observed in cross sections of mycorrhizal roots. Therefore it appears that members of all four classes may form mycorrhizae with sweetgum.

FILER, T. H., JR., and TOOLE, E. R.

1966. SWEETGUM MYCORRHIZAE AND SOME ASSOCIATED FUNGI. Forest Sci. 12: 432-437, illus.

Of 21 fungi tested in pure culture, 14 were found to be symbionts with sweetgum; 5 of these have not hitherto been recognized as mycorrhizal.

FILER, T. H., JR., AND TOOLE, E. R.

1968. EFFECT OF METHYL BROMIDE ON MYCORRHIZAE AND GROWTH OF SWEETGUM SEEDLINGS. USDA Plant Dis. Reporter 52: 483-485.

Fumigation of nursery beds with methyl bromide improved sweetgum growth by reducing the population of soil-inhabiting pathogens. Although mycorrhizal fungi were reduced, sufficient inoculum survived for rapid mycorrhizal development.

▼FROELICH, R. C., AND DELL, T. R.

1967. PRESCRIBED FIRE AS A POSSIBLE CONTROL FOR FOMES ANNOSUS. Phytopathology 57: 811.

Mortality from this root-rot fungus was curtailed where prescribed burning preceded initial thinning of loblolly and slash pine plantations.

FROELICH, R. C., DELL, T. R., AND WALKINSHAW, C. H.

1966. SOIL FACTORS ASSOCIATED WITH FOMES ANNOSUS IN THE GULF STATES. Forest Sci. 12: 356-361, illus.

Severely damaged pine plantations were on sites with less soil organic matter, higher pH, more sand or clay, and less grass than healthy stands. These relationships held for both cutover forest land and former agricultural land.

▼FROELICH, R. C., AND SNOW, G. A.

1964. TIPBURN AND KILLING OF SLASH PINES NEAR ELECTRIC POWER SUBSTATIONS IN SOUTH MISSISSIPPI. U. S. Dept. Agr. Plant Dis. Rptr. 48: 367-369, illus.

The disorder appears associated with the substations, but the exact cause is unknown. The trees range in size from seedlings to small sawtimber.

FROELICH, R. C., AND SNOW, G. A.

1965. PINE TREES NEAR POWER SUBSTATIONS DAMAGED BY UREA HERBICIDES. U. S. Dep. Agr. Plant Dis. Reporter 49: 970-971, illus.

Herbicides used to control weeds and grass caused chlorosis and death of slash pines 100 yards or more from the point of application.

▼HENRY, B. W.

1968. PEST CONTROL IN PINE PLANTATIONS. Proc., Symp. on Planted Southern Pines, pp. 73-76. USDA Southeast. Area, State and Priv. Forest., Atlanta, Ga.

Briefly reviews knowledge about major pests of southern pine plantations.

▼Jewell, F., and Eleuterius, L. N.

1963. Amphiphyllous uredia and telia of southern fusiform rust. U. S. Dept. Agr. Plant Dis. Rptr. 47: 65, illus.

Sori have been found on the upper as well as the lower surfaces of oak leaves.

JEWELL, F. F., TRUE, R. P., and MALLETT, S. L.
1962. HISTOLOGY OF CRONARTIUM FUSIFORME IN SLASH PINE SEEDLINGS. Phytopath. 52: 850-858, illus.
The fungus was characterized by intercellular, septate, uninucleate hyphae and unicellular, uninucleate, mostly unbranched haustoria. Host response included changes in arrangement, size, number, and shape of xylem, cortex, and phloem elements.

▼JEWELL, F. F., AND WALKER, N. M.
1965. NORMAL AND ABNORMAL MYCELIAL CHARACTERISTICS OF CRONARTIUM QUERCUUM IN SHORTLEAF PINE. Phytopathology 55: 1325-1327, illus.
The fungus has intercellular, septate, mostly uninucleate hyphae averaging 3.5μ in width, and usually unicellular, uninucleate, unbranched haustoria averaging 15.6 × 3.5μ. Binucleate hyphal cells and haustoria were often observed, however, and two-celled haustoria occurred occasionally; branched ones were rare. All tissues of the affected areas were invaded.

JEWELL, F. F., AND WALKER, N. M.
1967. HISTOLOGY OF CRONARTIUM QUERCUUM GALLS ON SHORTLEAF PINE. Phytopathology 57: 545-550, illus.
The mycelium of Cronartium quercuum *was found in all gall tissues except the periderm. Xylem rays were more numerous and higher in gall than in normal wood, and the ray parenchyma cells were longer and wider. Vertical tracheids in gall xylem were short and abnormal in shape. Resin ducts in galls were numerous and large in diameter. Gall phloem contained more rays than normal, and the gall cortex contained more parenchyma cells. Reaction parenchyma defined the separation of normal and abnormal tissue and marked the inner extent of the mycelium. The parasite did not influence the host beyond the limits of its mycelium.*

▼Kais, A. G.
1963. In vitro sporidial germination of Cronartium fusiforme. Phytopath. 53: 987, illus.
Examination of Cronartium fusiforme Hedgc. & Hunt ex Cumm. resulted in a composite illustration of the germination process, including secondary, tertiary, and quaternary sporidia.

KAIS, A. G.
1964. GERMINATION AND GROWTH OF SCIRRHIA ACICOLA IN LIQUID CULTURE INHIBITED BY CYCLOHEXIMIDE SEMICARBAZONE. U. S. Dept. Agr. Plant Dis. Rptr. 48: 553-556, illus.
Antibiotic concentrations from 0.1 to 100 p.p.m. checked development but did not kill the fungus.

KAIS, A. G.
1966. PERSISTENCE OF ALBINISM IN CRONARTIUM FUSIFORME. U. S. Dep. Agr. Plant Dis. Reporter 50: 842.
The albino form developed pycnia and aecia on inoculated pines.

▼KAIS, A. G., AND SNOW, G. A.
1965. MIMOSA WILT FOUND ALONG MISSISSIPPI COAST. U. S. Dep. Agr. Plant Dis. Reporter 49: 971.
Diseased trees have recently been found in several places.

▼KAIS, A. G., AND SNOW, G. A.
1969. HOST RESPONSE OF PINES TO VARIOUS ISOLATES OF CRONARTIUM QUERCUUM AND C. FUSIFORME. (Abstr.) Phytopathology 59: 1034-1035.
Tests with five pine species and several isolates of each fungus established the existence of races of C. quercuum.

▼KAIS, A. G., AND WALKINSHAW, C. H.
1964. WHITE-SPORED STRAIN OF CRONARTIUM FUSIFORME. U. S. Dept. Agr. Plant Dis. Rptr. 48: 686.
The first report of a recognizable, consistent variation in the fusiform rust fungus.

▼LORIO, P. L., JR.
1966. PHYTOPHTHORA CINNAMOMI AND PYTHIUM SPECIES ASSOCIATED WITH LOBLOLLY PINE DECLINE IN LOUISIANA. U. S. Dep. Agr. Plant Dis. Reporter 50: 596-597, illus.
The declining trees were on poorly drained, fine-textured soils in an area that had been under attack by the southern pine beetle.

MCCRACKEN, F. I.
1970. SPORE PRODUCTION OF HERICIUM ERINACEUS. Phytopathology 60: 1639-1641.
Phenological data indicate that spore production is highest about midday and is related to daily increases in temperature and decreases in relative humidity.

MCCRACKEN, F. I., AND FILER, T. H., JR.
1970. POLYPORUS ZONALIS ASSOCIATED WITH STEM BREAKAGE OF HACKBERRY IN ALABAMA. USDA Plant Dis. Rep. 54: 322-323.
Extensive butt rot, with the widest area of decay near the groundline, had weakened the trees.

MCCRACKEN, F. I., AND TOOLE, E. R.
1969. SPOROPHORE DEVELOPMENT AND SPORULATION OF POLYPORUS HISPIDUS. Phytopathology 59: 884-885.
Phenological data from west-central Mississippi.

POWERS, H. R., JR., and VERRALL, A. F.
1962. A CLOSER LOOK AT FOMES ANNOSUS. Forest Farmer 21 (13): 8-9, 16-17, illus.
A Southwide survey indicates that annosus root rot has caused considerable mortality in some thinned plantations of slash and loblolly pine, but not in natural stands. Damage is worst on former cropland, light soils, and slopes; and it increases with depth of A horizon and litter.

▼SHOULDERS, EUGENE, AND CZABATOR, F. J.
1965. CHLOROSIS IN A SOUTHERN PINE NURSERY: A CASE STUDY. U. S. Forest Serv. Tree Planters' Notes 71, pp. 19-21.
Chlorosis was minimized by adjusting soil pH to between 5.5 and 6.0 and fertilizing moderately.

▼Smalley, G. W., and Scheer, R. L.
1963. Black root rot in Florida sandhills. U. S. Dept. Agr. Plant Dis. Rptr. 47: 669-671, illus.
The rot, caused by a fungus complex of Sclerotium bataticola and Fusarium species, has recently been found in pine plantations on the deep sandy soils of western Florida. Though it attacks all species of pines in the area, it appears to have caused mortality only in young plantations of slash pine.

Snow, G. A.
1968. BASIDIOSPORE PRODUCTION BY CRONARTIUM FUSIFORME AS AFFECTED BY SUB-OPTIMAL TEMPERATURES AND PRECONDITIONING OF TELIOSPORES. Phytopathology 58: 1541-1546.
The time required for release of basidiospores to begin and reach a maximum rate was inversely related to temperatures between 12 and 19.5 C.

▼Snow, G. A.
1968. TIME REQUIRED FOR INFECTION OF PINE BY CRONARTIUM FUSIFORME AND EFFECT OF FIELD AND LABORATORY EXPOSURE AFTER INOCULATION. Phytopathology 58: 1547-1550.
For potted slash pine seedlings inoculated with basidiospores, the shortest incubation period was 4 hours.

Snow, G. A., Czabator, F. J., and Sorrels, S. S.
1964. CYCLOHEXIMIDE DERIVATIVES FOR CONTROLLING BROWN SPOT ON LONGLEAF PINE. U. S. Dept. Agr. Plant Dis. Rptr. 48: 551-553.
At 25 p.p.m. semicarbazone and methyl hydrazone were less effective than bordeaux. At 50 p.p.m. the performance of semicarbazone (but not methyl hydrazone) improved, and still higher concentrations might be desirable.

Snow, G. A., and Froelich, R. C.
1968. DAILY AND SEASONAL DISPERSAL OF BASIDIOSPORES OF CRONARTIUM FUSIFORME. Phytopathology 58: 1532-1536.
In a pine-hardwood stand in southern Mississippi, spores could usually be collected during the night and early morning, when relative humidity was 97 percent or more. Seasonal occurrence was governed by development and condition of telia and by weather favorable for germination of teliospores.

Snow, G. A., Froelich, R. C., and Popham, T. W.
1968. WEATHER CONDITIONS DETERMINING INFECTION OF SLASH PINES BY CRONARTIUM FUSIFORME. Phytopathology 58: 1537-1540.
Infection of pine tissue becomes likely when (1) moisture is abundant, as evidenced by relative humidity of 97 percent or above, or by rain or heavy dew; (2) temperature is above 16 C.; and (3) these moisture-temperature conditions persist for at least 9 hours.

▼Snow, G. A., Jewell, F. F., and Eleuterius, L. N.
1963. Apparent recovery of slash and loblolly pine seedlings from fusiform rust infection. U. S. Dept. Agr. Plant Dis. Rptr. 47: 318-319, illus.
Of 200 seedlings that were galled when lifted from the nursery bed, 15 seemed disease-free after 2½ years in plantation.

Snow, G. A., and Kais, A. G.
1966. OAK LEAF DEVELOPMENT DURING AECIAL SPORULATION OF CRONARTIUM FUSIFORME. U. S. Dep. Agr. Plant Dis. Reporter 50: 388-390, illus.
Aeciospore release is well synchronized with the presence of susceptible young oak leaves in Mississippi. Aeciospores and susceptible water oak leaves occurred at the same time for 47 days in 1964 and 39 days in 1965.

Snow, G. A., and Kais, A. G.
1970. PATHOGENIC VARIABILITY IN ISOLATES OF CRONARTIUM FUSIFORME FROM FIVE SOUTHERN STATES. Phytopathology 60: 1730-1731.
Differential reactions of slash pines to isolates of C. fusiforme from five southern locations indicate that pathogenic variability occurs in this rust.

Snow, G. A., Powers, H. R., Jr., and Kais, A. G.
1969. PATHOGENIC VARIABILITY IN CRONARTIUM FUSIFORME. Tenth South. Forest Tree Impr. Conf. Proc. 1969: 136-139.
"We have found no evidence of variability . . . which is of a magnitude that can be detected with different species of pine. However, . . . differences . . . in the capacity of rust isolate to infect resistant within-species selections of pine indicate that pathogenic variability does exist in C. fusiforme."

Snow, G. A., and Roncadori, R. W.
1965. OAK LEAF AGE AND SUSCEPTIBILITY TO CRONARTIUM FUSIFORME. U. S. Dep. Agr. Plant Dis. Reporter 49: 972-975, illus.
Leaves became progressively more resistant as they matured. Uredial development was restricted before telial.

▼Toole, E. R.
1962. BOTRYOSPHAERIA RIBIS, CAUSE OF A TRUNK LESION OF SWEETGUM. (Abstract.) Phytopath. 52: 30.
The lesions, which are found only in bottom lands within 100 miles of the Gulf Coast, result from the killing of limited but adjacent patches of cambium in successive years.

▼Toole, E. R.
1962. COTTONWOOD CANKER. South. Lumberman 204(2539): 42, 44, illus.
Fusarium solani cankered many trees that had been deeply flooded in the spring of 1961. Rot quickly developed behind the cankers, and in a few months many trees died on the stump or broke off.

Toole, E. R.
1962. TUPELO LESION CAUSED BY FUSARIUM SOLANI. U. S. Dept. Agr. Plant Dis. Rptr. 46: 732-733, illus.
Stem swelling and roughened bark result from the killing, in successive years, of small but contiguous patches of cambium.

Toole, E. R.
1963. Cottonwood canker caused by Fusarium solani. U. S. Dept. Agr. Plant Dis. Rptr. 47: 1032-1035,

illus.

The fungus produced cankers when introduced into wounds in cottonwood, either by direct inoculation or by floating spores on the surface of water around partly submerged stems. The latter is a likely mode of infection in nature. In cross-inoculations, strains from cottonwood, tupelo, and yellow-poplar differed in pathogenicity and were most virulent on their parent host.

Toole, E. R.
1963. Site affects rate of decay in cherrybark oak. U. S. Dept. Agr. Plant Dis. Rptr. 47: 568.

In the laboratory, wood from trees on good sites decayed more slowly than wood from trees on poor sites.

▼Toole, E. R.
1963. Sweetgum lesion caused by Botryosphaeria ribis. U. S. Dept. Agr. Plant Dis. Rptr. 47: 229-231, illus.

Several strains of the fungus can produce lesions of a kind common on trunks of sweetgums in bottom lands along the Gulf Coast.

Toole, E. R.
1964. HARDWOOD NURSERY DISEASES. Region 8 Forest Nurseymen's Conferences Proc. 1964: 148-150. U. S. Forest Serv. South. Region.

Briefly discusses damping-off, root rot, leaf diseases, and top blights and wilts.

Toole, E. R.
1964. PROGRESS OF OAK HEART ROT VARIES WITH HEIGHT IN TREE. U.S. Dept. Agr. Plant Dis. Rptr. 48: 585.

In Nuttall oaks inoculated with Pleurotus ostreatus, *the rate of heart rot development increased progressively with height of inoculations in the tree.*

Toole, E. R.
1964. ROT CULL IN BLACK WILLOW. U. S. Forest Serv. Res. Note SO-14, 2 pp., illus.

In stands on the batture of the lower Mississippi River, the proportion of volume rendered cull by rot increased with stand age but was less than 1 percent after 30 years, by which time most pure stands were breaking up.

▼Toole, E. R.
1965. DECAY 10 YEARS AFTER THINNING OF SWEETGUM SPROUT CLUMPS. U. S. Dep. Agr. Plant Dis. Reporter 49: 986, illus.

Amount of rot in live stems was negligible.

Toole, E. R.
1965. INOCULATION OF BOTTOM-LAND RED OAKS WITH PORIA AMBIGUA, POLYPORUS FISSILIS, AND POLYPORUS HISPIDUS. U. S. Dep. Agr. Plant Dis. Reporter 49: 81-83, illus.

After the first 2 years, by which time the small inoculation wounds had healed, decay did not advance significantly in willow and Nuttall oak.

Toole, E. R.
1966. COMPARISON OF TWO METHODS FOR INOCULATING NUTTALL OAKS WITH PLEUROTUS OSTREATUS. U. S. Dep. Agr. Plant Dis. Reporter 50: 552-553, illus.

Inserting rotted dowels stuffed with infected oats usually was more successful than insertion of oats alone; the inoculations were in holes bored in the trunks 4 feet above ground.

Toole, E. R.
1966. ROOT ROT CAUSED BY POLYPORUS LUCIDUS. U. S. Dep. Agr. Plant Dis. Reporter 50: 945-946, illus.

Though not highly virulent, the fungus can kill sweetgum and mimosa, and can infect green ash, Nuttall oak, and sycamore, by attacking their roots.

▼Toole, E. R.
1966. STEM CANKER OF RED OAKS CAUSED BY FUSARIUM SOLANI. U. S. Dep. Agr. Plant Dis. Reporter 50:160-161, illus.

When tested by inoculations of Nuttall oak seedlings, a strain isolated from cankers on red oaks was more virulent than strains from cankers on tupelo, cottonwood, and yellow-poplar.

▼Toole, E. R.
1967. MELAMPSORA MEDUSAE CAUSES COTTONWOOD RUST IN LOWER MISSISSIPPI VALLEY. Phytopathology 57: 1361-1362, illus.

Inoculation tests, plus morphological similarity of the uredia and telia, establish that this fungus causes a defoliating rust on Populus deltoides.

Toole, E. R.
1967. RATES OF WOOD DECAY BEHIND OPEN AND CLOSED WOUNDS. U. S. Dep. Agr. Plant Dis. Reporter 51, p. 600, illus.

Wounds in Nuttall oak inoculated with Pleurotus ostreatus *and kept open 5 years averaged 36 inches vertically of rot. Rot in wounds allowed to heal averaged 3 inches. Rot developed in all open wounds, but in only half the healed wounds.*

Toole, E. R.
1967. ROOT ROT OF SOUTHERN HARDWOOD TREES CAUSED BY CORTICIUM GALACTINUM. U. S. Dep. Agr. Plant Dis. Reporter 51: 500-501, illus.

American sycamore, sweetgum, Nuttall oak, and white oak were much more susceptible than green ash and water oak. Mimosa was unaffected.

Toole, E. R.
1968. STEREUM TAXODII CAUSES PECK IN CYPRESS. USDA Plant Dis. Reporter 52: 482-483.

Inoculations established that the fungus is pathogenic on baldcypress.

Toole, E. R.
1968. WETWOOD IN COTTONWOOD. USDA Plant Dis. Reporter 52: 822-823.

In 13 stands between Vicksburg and Memphis, 86 percent of the eastern cottonwood

trees over 6 inches in diameter contained wetwood. Wetwood areas contained more moisture and had higher pH than normal sapwood. Gas pressure in affected trees was as high as 25.5 p.s.i. A rod-shaped, gram-negative bacterium was consistently isolated from wetwood.

TOOLE, E. R., AND FILER, T. H., JR.
1965. COLLETOTRICHUM GLOEOSPORIOIDES ON DOGWOOD. U. S. Dep. Agr. Plant Dis. Reporter 49: 351, illus.
The fungus caused defoliation, twig dieback, and stem lesions on 1-year-old seedlings in a Texas nursery. Inoculations of small trees in Mississippi resulted in stem cankering.

TOOLE, E. R., AND KRINARD, R. M.
1967. DECAY IN BEAVER-DAMAGED SOUTHERN HARDWOODS. Forest Sci. 13: 316-318, illus.
In trees that had been partially girdled by beaver, rots 2 inches deep were observed after 5 years in Celtis laevigata, *6 years in* Fraxinus *sp., and 8 years in* Liquidambar styraciflua. *A 10-year salvage cycle is recommended.*

VERRALL, A. F.
1962. ANNOSUS ROOT ROT SURVEY. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 141.
See Powers and Verrall 1962., A CLOSER LOOK AT FOMES ANNOSUS.

▼Verrall, A. F.
1963. Brown spot needle blight. *In* Important forest diseases of mutual concern to member countries of the North American forestry commission, pp. 64-65. Compiled by Working Group on Forest Insects and Diseases, North American Forestry Comn., FAO.
Brief description.

▼VERRALL, A. F.
1963. Brown-spot needle blight. *In* Internationally dangerous forest tree diseases. U. S. Dept. Agr. Misc. Pub. 939, pp. 111-112.
Descriptions of disease and fungus; list of pine hosts, geographic range.

▼VERRALL, A. F.
1963. Control of diseases in southern forests. Soc. Amer. Foresters Proc. 1962: 138-139.
Development of resistant strains and manipulations of the forest environment to create conditions unfavorable to disease both hold great promise. Direct controls, as by spraying, will be of some use. Biological control seems unpromising.

▼Verrall, A. F.
1963. Southern fusiform rust. *In* Important forest diseases of mutual concern to member countries of the North American forestry commission, pp. 20-22. Compiled by Working Group on Forest Insects and Diseases, North American Forestry Comn., FAO.
Brief description.

▼Verrall, A. F.
1963. Southern fusiform rust. *In* Internationally dangerous forest tree diseases. U. S. Dept. Agr. Misc. Pub. 939, pp. 93-94.
Brief descriptions of disease and fungus; lists of oak and pine hosts; geographic range.

▼ VERRALL, A. F.
1964. DISEASES OF THE HARD PINES. *In* Diseases of Widely Planted Forest Trees, pp. 56-84. Working Group on International Cooperation in Forest Disease Research, Section 24, Forest Protection, International Union of Forestry Research Organizations. Published by Forest Service, U. S. Dept. Agr.
Lists causal organisms, hosts, and ranges.

▼VERRALL, A. F.
1966. IMPACT OF DISEASE RESEARCH IN ALABAMA. Proc., 4th Auburn Forestry Forum, pp. 24-29. Ala. Agr. Exp. Sta., Auburn, Ala.
"Disease research . . . has given timber growers and manufacturers sure ways to control some pathogens, and has enabled them to combat others on more than even terms."

▼VERRALL, A. F.
1967. BROWN SPOT NEEDLE BLIGHT. *In* Important forest insects and diseases of mutual concern to Canada, the United States and Mexico, pp. 237-238. Can. Dep. Forest. and Rural Develop. Pub. 1180.
Distribution, life history, controls.

▼VERRALL, A. F.
1967. SOUTHERN FUSIFORM RUST. *In* Important forest insects and diseases of mutual concern to Canada, the United States and Mexico, pp. 221-223. Can. Dep. Forest. and Rural Develop. Pub. 1180.
Description, life history, and controls.

VERRALL, A. F., AND CZABATOR, F. J.
1970. FUSIFORM RUST OF SOUTHERN PINES. USDA Forest Pest Leafl. 26 rev., 6 p.
Life cycle, hosts, and control.

WAKELEY, P. C.
1970. THIRTY-YEAR EFFECTS OF UNCONTROLLED BROWN SPOT ON PLANTED LONGLEAF PINE. Forest Sci. 16: 197-202.
Of seedlings classified for brown spot infection in their fourth and fifth growing seasons, the lightly infected survived and grew better than the heavily infected. By age 30 years, any given number of trees classified as lightly infected had produced averages of 1.7 to 2.4 times as much pulpwood as an equal number classified as moderately to heavily infected.

▼ WALKINSHAW, C. H.
1965. CHEMICAL INHIBITION IN GERMINATION OF CRONARTIUM FUSIFORME AECIOSPORES. Phytopathology 55: 996-999, illus.
Products of lipid metabolism, including lower-chain fatty acids and intermediates of the glyoxylate cycle, were found especially inhibitory to aeciospore germination; the acid forms were more inhibitory than their conjugate bases. Hexose sugars and other compounds that may affect Krebs-

cycle metabolism generally were not inhibitory. The amino acids, L-serine, L-cysteine, and DL-aspartic acid, slightly reduced germination, and homocysteine was toxic at 0.005 M.

Low concentrations of cycloheximide (Actidione) were strongly inhibitory, but this inhibition could be overcome by adding some Krebs-cycle acids to the test solution.

▼Walkinshaw, C. H., Hyde, J. M., and Van Zandt, J.
1967. fine structure of quiescent and germinating aeciospores of cronartium fusiforme. J. Bacteriol. 94: 245-254, illus.
Morphological details.

Walkinshaw, C. H., Jewell, F. F., and Walker, N. M.
1965. callus culture of fusiform rust-infected slash pine. U. S. Dep. Agr. Plant Dis. Reporter 49:616-618, illus.
C. fusiforme *was maintained in an apparently viable condition for 5 months. Indications are that it can be stimulated to grow in culture.*

Walkinshaw, C. H., and Scheld, H. W.
1965. response of spores of cronartium fusiforme and lenzites saepiaria to metabolites. Phytopathology 55: 475-476.
Germination experiments suggest basic differences in spore metabolism of the two species. Fresh spores of C. fusiforme *were independent of exogenous nutrients, but aged spores were stimulated by addition of long-chain fatty acids.* L. saepiaria *spores required exogenous nutrients. Metabolism during germination appeared to be aerobic in* C. fusiforme *and anaerobic in* L. saepiaria.

Walkinshaw, C. H., Sweet, H. C., Venketeswaran, S., and Horne, W. H.
1970. results of apollo 11 and 12 quarantine studies on plants. BioScience 20: 1297-1302.
Lunar material did not harm plants and appeared to have beneficial effects on bryophytes, ferns, and tissue cultures of higher plants.

PRODUCTS

▼Amburgey, T. L.
1970. genetic control of basidiospore formation by isolates of lenzites trabea. Phytopathology 60: 951-954.
Proposes a model to account for the formation of fertile basidiocarps. Variation in capacity to cause decay and to produce cellulolytic enzymes indicates that fruiting monobasidiospore isolates have two nuclear types that are homozygous at the locus governing sexual incompatibility but heterozygous at other loci.

▼Amburgey, T. L.
1970. relationship of capacity to cause decay to other physiological traits in isolates of lenzites trabea. Phytopathology 60:955-960.
Variation among homokaryotic, dikaryotic, and mono-oidial isolates was studied to determine the relationship between capacity to cause decay and rate of linear growth, incompatibility factors, cytoplasmic factors, and ratio of the two nuclear types in a dikaryon.

Carpenter, B. E., Jr., and Toole, E. R.
1963. Sprinkling with water protects hardwood logs in storage. South. Lumberman 207(2576): 25-26, illus.
After 4 months of summer storage under either full-time or on-and-off sprays, logs of red oak, sweetgum, cottonwood, and hackberry were virtually free of stain and decay. Dry-stored logs were badly stained. After a year, stain had reduced values 14 percent in hackberry and 1 to 2 percent in other species, while unsprayed logs were worthless.

▼Hyde, J. M., and Walkinshaw, C. H.
1966. ultrastructure of basidiospores and mycelium of lenzites saepiaria. J. Bacteriol. 92: 1218-1227, illus.
Describes methods of fixation and cytology of ungerminated and germinated basidiospores and 2-day-old mycelial cultures.

▼Scheffer, T. C., Verrall, A. F., and Harvey, George.
1963. On-site preservative treatments: their effectiveness for exterior millwork of different species used in various climates. Forest Prod. Jour. 13: 7-13, illus.
Dipping precut stock for 3 minutes in a 5-percent solution of pentachlorophenol in light oil gives about 7 years' protection, even in hot, humid climates.

Toole, E. R.
1965. deterioration of hardwood logging slash in the south. U. S. Dep. Agr. Tech. Bull. 1328, 27 pp., illus.
Cottonwood tops ceased being a serious fire hazard after about 3 years; tops of other hardwoods, after about 6 years. The rot fungi most often identified were Schizophyllum commune, Polyporus versicolor, Stereum complicatum, *and* Daedalea confragosa.

▼Toole, E. R.
1966. early salvage necessary for hardwood tops. Miss. Farm Res. 29(5): 8, illus. *Also as* decay of hardwood logging slash. Miss. Agr. Exp. Sta. Inform. Sheet 932, 2 pp., illus.
Bolts in tops of spring-cut trees should be salvaged almost immediately; those in fall-cut tops should be removed in winter or early spring. Cottonwood tops are a fire hazard for 3 years after logging, tops of other species for about 6 years.

Verrall, A. F.
1962. condensation in air-cooled buildings. Forest Prod. Jour. 12: 531-536, illus.
In the South Atlantic and Gulf States damaging amounts of condensation occur often enough to warrant preventive measures.

▼Verrall, A. F.
1962. the deterioration of wood in service. La. State Univ., Quality Control Short Course Proc. 1961: 39-42.
General discussion.

VERRALL, A. F.
1963. Water-repellent preservatives on exterior woodwork of buildings. Forest Prod. Jour. 13: 460-462, illus.
Exterior woodwork can be protected by pretreatment with a water-repellent preservative, provided the building is designed to restrict wetting by rain. Dipping lumber for 3 minutes after it has been cut to size is preferable, but brush or spray applications after the wood is nailed in place are also useful.

▼ VERRALL, A. F.
1964. USE OF WOOD IN HOUSES. Ala. Forest Prod. 7(11): 18-19.
Proper use includes selection of the right lumber for particular purposes; design that minimizes entry of water, insects, and fungi; and regular maintenance.

▼VERRALL, A. F.
1965. DECAY OF WOOD. *In* Consumers All, pp. 30-34, illus. U. S. Dep. Agr. Yearbook 1965.
Prevention and control, in brief.

▼VERRALL, A. F.
1965. MOISTURE CONTENT OF WOOD IN BUILDINGS. *In* Moisture in Materials in Relation to Fire Tests, pp. 29-37, illus. Amer. Soc. for Testing and Mater., ASTM Spec. Tech. Pub. 385.
Reviews literature on moisture contents as influenced by relative humidity and wetting by liquid water; by climate, season, and building use; and by location in the building.

VERRALL, A. F.
1965. PRESERVING WOOD BY BRUSH, DIP, AND SHORT-SOAK METHODS. U. S. Dep. Agr. Tech. Bull. 1334, 50 pp., illus.
On-the-job applications of preservatives are useful for woodwork exposed to low or moderate hazard of decay. Extensive tests have identified many of the factors that determine success in practical application.

VERRALL, A. F.
1966. BUILDING DECAY ASSOCIATED WITH RAIN SEEPAGE. U. S. Dep. Agr. Tech. Bull. 1356, 58 pp., illus.
Describes the symptoms of rain seepage, identifies the fungi that cause decay in exterior woodwork wet by seepage, and summarizes experiments and observations that indicate how damage may be prevented in new buildings or arrested in old ones.

VERRALL, A. F.
1968. PORIA INCRASSATA ROT: PREVENTION AND CONTROL IN BUILDINGS. USDA Tech. Bull. 1385, 27 pp.
Though attacks by this fungus are uncommon in standard construction, they are very damaging when they do occur. The fungus can conduct water from moist soil or concrete to wood normally dry, and hence can spread rapidly. It is controlled by breaking its contact with the water supply.

▼VERRALL, A. F.
1969. ATTACK BY PLANT ORGANISMS ON SOUTHERN PINE WOOD—A REVIEW. Forest Prod. J. 19(7): 40-46.
Practical measures are available for protecting most green or seasoned products against stain, mold, and decay, but improvements are desirable.

▼VERRALL, A. F., AND SCHEFFER, T. C.
1969. PRESERVATIVE TREATMENTS FOR PROTECTING WOOD BOXES. USDA Forest Serv. Res. Pap. FPL-106, 8 pp. Forest Prod. Lab., Madison, Wis.
Three-minute dips in various preservatives with and without a water repellent kept boxes in good condition during 10 years of outdoor exposure at Gulfport, Mississippi, and Madison, Wisconsin.

INSECTS

TREES

BARRAS, S. J.
1967. THORACIC MYCANGIUM OF DENDROCTONUS FRONTALIS (COLEOPTERA: SCOLYTIDAE) IS SYNONYMOUS WITH A SECONDARY FEMALE CHARACTER. Ann. Entomol. Soc. Amer. 60: 486-487, illus.
A transverse ridge across the anterior area of the pronotum of the female is external evidence of a mycangium.

BARRAS, S. J.
1969. PENICILLIUM IMPLICATUM ANTAGONISTIC TO CERATOCYSTIS MINOR AND C. IPS. Phytopathology 59: 520.
The Ceratocystis *species are found in galleries of pine bark beetles.* Penicillium implicatum *occurs in galleries of the black turpentine beetle.*

BARRAS, S. J.
1970. ANTAGONISM BETWEEN DENDROCTONUS FRONTALIS AND THE FUNGUS CERATOCYSTIS MINOR. Ann. Entomol. Soc. Amer. 63: 1187-1190.
When the blue-staining fungus C. minor *is acting alone in the phloem of a pine tree, it is detrimental to development of the southern pine beetle.*

BARRAS, S. J., AND HODGES, J. D.
1969. CARBOHYDRATES OF INNER BARK OF PINUS TAEDA AS AFFECTED BY DENDROCTONUS FRONTALIS AND ASSOCIATED MICROORGANISMS. Can. Entomol. 101: 489-493.
Glucose, fructose, and sucrose were the only sugars detected in inner bark treated with a southern pine beetle-microorganism complex and two beetle-associated fungi. Treatments drastically lowered the reduc-

ing-sugar level. Storage of untreated bolts had no effect on reducing-sugar level; sucrose was lowered but not as much as in treated tissue. Starch content remained unchanged in all treatments.

▼ BEAL, J. A., BENNETT, WM. H., AND KETCHAM, D. E.
1964. BEETLE EXPLOSION IN HONDURAS. Amer. Forests 70(11): 31-33, illus.
More than 8.5 billion board feet of high-quality pine has been destroyed in Honduras by an epidemic of the southern pine beetle, and the remaining stands are threatened. Most infestations started on mountain ridges and steep slopes where the soil was poor and man-caused fires were frequent.

BEAL, R. H.
1967. HEAVY TIP MOTH ATTACKS REDUCE EARLY GROWTH OF LOBLOLLY AND SHORTLEAF PINE. U.S. Forest Serv. Res. Note SO-54, 3 pp.
Protected trees outgrew heavily attacked trees during the first 6 years after planting.

▼BENNETT, W. H.
1961. COMMON INSECT ENEMIES OF PINES IN THE SOUTHERN UNITED STATES. Jour. South African Forestry Assoc., No. 39, pp. 13-18, illus.
Brief descriptions.

▼ BENNETT, W. H.
1965. BENZENE HEXACHLORIDE EMULSION FOR CONTROLLING BLACK TURPENTINE BEETLE IN LOGGING AREAS. J. Econ. Ent. 58: 358.
Sprays of 1.0 percent protected pine stumps and live trees for 6 months. Performance equalled that to be expected from 0.5 percent in oil, which is standard for the purpose but more costly and inconvenient to use.

▼ BENNETT, W. H.
1965. IMPACT OF INSECT RESEARCH ON ALABAMA'S FORESTS. Ala. Forest Prod. 8(10): 25-26, 28-29, illus.
Chemical controls developed through research are effective but costly, and results are temporary. Current aims are to formulate silvicultural, biological, and genetic measures that will prevent rather than control outbreaks.

BENNETT, W. H.
1965. SILVICULTURAL CONTROL OF SOUTHERN FOREST INSECTS. *In* Insects in Southern Forests, pp. 51-63. Louisiana State Univ. Fourteenth Ann. Forest. Symp. Proc. 1964.
Insect attacks are most likely in stands that are of a single species and age class, have become overmature or overdense, are on poor sites, or have been damaged by fire or careless use of logging machinery.

▼BENNETT, W. H.
1966. PEST PROBLEMS OF DIRECT-SEEDED AND PLANTED STOCK. Proc., Direct Seeding Workshops, Alexandria, La., and Tallahassee, Fla., pp. 58-59. U. S. Forest Serv., Atlanta, Ga.
At present, it is impossible to say whether direct-seeded trees are more or less subject to pests than planted ones.

BENNETT, W. H.
1966. PUPAL MORPHOLOGY OF EXOTELEIA CHILLCOTTI FREEMAN (LEPIDOPTERA, GELECHIIDAE). Proc., Entomol. Soc. Wash. 68: 181-183, illus.
This recently described insect is a common needle miner of longleaf pine. In appearance and behavior it resembles a northern species, E. pinifoliella.

BENNETT, W. H.
1967. DIELDRIN FOR PROTECTING DIRECT-SEEDED LONGLEAF PINES FROM THE WHITE-FRINGED BEETLE, GRAPHOGNATHUS PERIGRINUS (BUCHANAN). J. Econ. Entomol. 60: 1186.
Mortality of direct-seeded pines was reduced when 10 percent dieldrin granules were applied at the rate of 3 pounds technical per acre.

BENNETT, W. H.
1967. THE TEXAS LEAF-CUTTING ANT. USDA Forest Pest Leafl. 23 rev., 4 p.
Life history and control.

BENNETT, W. H.
1968. TIMBER MANAGEMENT AND SOUTHERN PINE BEETLE RESEARCH. Forest Farmer 27(9): 12-13.
The U. S. Forest Service's insect research project at Alexandria, Louisiana, is concentrating on causes of pine bark beetle epidemics and silvicultural ways of preventing them.

▼ BENNETT, W. H.
1969. KNOWLEDGE OF SEED-ORCHARD PESTS SCANTY. Southeast. Area Forest Nurserymen's Conf. Proc. 1968: 148-149.
Intensification of research on cone and seed insects is desirable.

BENNETT, W. H., AND OSTMARK, H.E.
1969. THE TRUTH ABOUT TESSIE TEREBRANS. USDA Forest Serv. South. Forest Exp. Stn. Occas. Pap. 174 rev., 16 p. *Also as* LA VERDAD SOBRE TERESITA TEREBRANS. Cent. Reg. Ayuda Tec., Agencia Desarrollo Int. (AID), 15 p. Mexico. 1968.
Illustrated booklet on black turpentine beetle.

BENNETT, W. H., AND PICKARD, L. S.
1966. BENZENE HEXACHLORIDE EMULSION AS A SUMMER CONTROL OF THE SOUTHERN PINE BEETLE. J. Econ. Entomol. 59: 484.
A spray of 1.0 percent of the gamma isomer in water was as effective as the standard 0.5 percent oil solution in summer, but not in winter.

▼ BLUM, M. S., MOSER, J. C., and CORDERO, A. D.
1964. SOURCE AND SPECIFICITY OF THE ODOR TRAIL SUBSTANCES IN FOUR ATTINE GENERA (HYMENOPTERA: FORMICIDAE). Psyche 71(1): 1-7.
On artificial trails in the laboratory, odor trail substances were nongeneric specific. When trails of different gen-

era crossed in the field, however, workers of one genus did not violate trails of other genera. Additional substances that render trails specific to genus, at least, must be present.

BURNS, R. M.
1966. TIP MOTHS IN THE SANDHILLS. Forest Farmer 26(1): 12, 14, illus.
In the sandhills of northwest Florida shortleaf pine and Choctawhatchee sand pine became heavily infested, but their growth was not retarded much. Loblolly pine was seriously damaged unless protected by DDT or phorate.

COYNE, J. F.
1968. LASPEYRESIA INGENS, A SEEDWORM INFESTING CONES OF LONGLEAF PINE. Ann. Entomol. Soc. Amer. 61: 1116-1122.
Description and life history of one of the chief insect enemies of longleaf pine seed.

COYNE, J. F.
1968. SIMULATED NANTUCKET PINE TIP MOTH ATTACKS REDUCE ROOT DEVELOPMENT OF SHORTLEAF PINE SEEDLINGS. J. Econ. Entomol. 61: 319-320.
Removal of the growing tips of shortleaf pine seedlings to simulate tip moth damage did not significantly affect root development when it was done for only 1 year. Two years of simulated attacks reduced root development.

COYNE, J. F.
1970. NEODIPRION TAEDAE LINEARIS: A SAWFLY PEST OF LOBLOLLY AND SHORTLEAF PINES. USDA Forest Pest Leafl. 34 rev., 4 p.
Habits and control of a sawfly that is one of the worst insect pests of loblolly and shortleaf stands in the South-Central States.

▼ECHOLS, H. W.
1964. GNAMPTOGENYS HARTMANI (HYMENOPTERA: FORMICIDAE) DISCOVERED IN LOUISIANA. Annals Ent. Soc. Amer. 57: 137.
Complete reproductive colonies, the first to be reported in the U. S., were found in an upland forest of northwest Louisiana.

▼ECHOLS, H. W.
1965. GOING TO TOWN ON THE TOWN ANT. Forests and People 15(1): 10, 12, 34, illus.
See item below.

▼ECHOLS, H. W.
1965. TOWN ANTS CONTROLLED WITH MIREX BAITS. U. S. Forest Serv. Res. Note SO-18, 2 pp., illus.
In exploratory tests in central Louisiana, colonies of Atta texana *(Buckley) have been destroyed with bait containing mirex, a chemical used on the imported fire ant.*

ECHOLS, H. W.
1966. ASSIMILATION AND TRANSFER OF MIREX IN COLONIES OF TEXAS LEAF-CUTTING ANTS. J. Econ. Entomol. 59: 1336-1338.
Foraging workers feed directly on bait containing mirex and pass the toxicant to other members of the colony by regurgitation.

▼ECHOLS, H. W.
1966. COMPATIBILITY OF SEPARATE NESTS OF TEXAS LEAF-CUTTING ANTS. J. Econ. Entomol. 59: 1299-1300, illus.
Of 137 established nests examined in Louisiana, 30 percent had independent young colonies within the central nest areas. Young colonies merged readily in laboratory and field trials, forming colonies with multiple queens.

▼ECHOLS, H. W.
1966. LOUISIANA'S NEW "GHOST TOWNS." Forests and People 16(4): 28-29.
Research at Alexandria, Louisiana, has developed a pelleted bait that gives efficient control of the Texas leaf-cutting ant.

▼ECHOLS, H. W.
1966. TEXAS LEAF-CUTTING ANT CONTROLLED WITH PELLETED MIREX BAIT. J. Econ. Entomol. 59: 628-631.
A pelleted bait containing 0.45 percent mirex plus soybean oil in a citrus-pulp carrier gave excellent control of the Texas leaf-cutting ant, Atta texana *(Buckley), in all seasons. The minimum dosage is approximately 1 gram per mound, broadcast over the central nest area plus a 20-foot peripheral zone.*

ECHOLS, H. W., AND BIESTERFELDT, R. C.
1966. CONTROLLING TEXAS LEAF-CUTTING ANTS WITH MIREX. U. S. Forest Serv. Res. Note SO-38, 2 pp., illus.
The ants readily take a pelleted bait containing 8.5 percent soybean oil and 0.45 percent mirex, with citrus pulp as a carrier.

GRANO, C. X, AND GRIGSBY, H. C.
1968. SPRAYING SOUTHERN PINES NOT PRACTICAL FOR TIP-MOTH CONTROL. USDA Forest Serv. Res. Note SO-77, 2 pp.
Planted loblolly, shortleaf, and shortleaf × slash hybrid pines chemically sprayed for 8 years were taller and had greater diameter than their unsprayed counterparts, but the cost of treatment was prohibitive.

HAY, C. J., AND MORRIS, R. C.
1970. CARPENTERWORM. USDA Forest Pest Leafl. 64 rev., 8 p.
Life history and habits of one of the worst pests of hardwood trees.

▼HERMANN, H. R., MOSER, J. C., AND HUNT, A. N.
1970. THE HYMENOPTEROUS POISON APPARATUS. X. MORPHOLOGICAL AND BEHAVIORAL CHANGES IN ATTA TEXANA (HYMENOPTERA: FORMICIDAE). Ann. Entomol. Soc. Amer. 63: 1552-1558.
Sclerites composing the stinging apparatus in most aculeate Hymenoptera are present in Atta texana, *but are modified*

and function only to lay trail. The primary defense mechanism is the mandibles.

HODGES, J. D., BARRAS, S. J., AND MAULDIN, J. K.
1968. AMINO ACIDS IN INNER BARK OF LOBLOLLY PINE, AS AFFECTED BY THE SOUTHERN PINE BEETLE AND ASSOCIATED MICROORGANISMS. Can. J. Bot. 46: 1467-1472.
Infection with two beetle-associated fungi and the beetle-microorganism complex resulted in no qualitative changes in free amino acids and minor changes in protein-bound amino acids. Concentration of most free amino acids and soluble N was decreased, however, and that of most protein-bound amino acids, insoluble N, and total N was increased.

HODGES, J. D., BARRAS, S. J., AND MAULDIN, J. K.
1968. FREE AND PROTEIN-BOUND AMINO ACIDS IN INNER BARK OF LOBLOLLY PINE. Forest Sci. 14: 330-333.
The inner bark of a tree felled in December contained at least 34 free amino acids, of which 20 appeared in the protein fraction. In bolts stored 2 weeks, the concentration of free acids decreased, whereas protein-bound acids increased.

▼HUNTER, P. E., AND MOSER, J. C.
1968. PSEUDOPARASITUS THATCHERI N. SP. (ACARINA: DERMANYSSIDAE, LAELAPINAE) ASSOCIATED WITH SOUTHERN PINE BEETLES. Fla. Entomol. 51: 119-123.
Describes adult and nymphal stages of this mite.

LORIO, P. L., JR.
1968. SOIL AND STAND CONDITIONS RELATED TO SOUTHERN PINE BEETLE ACTIVITY IN HARDIN COUNTY, TEXAS. J. Econ. Entomol. 61: 565-566.
During a population buildup from 1957 through 1961, infestations occurred primarily within two soil associations that are comprised mostly of poorly and imperfectly drained soils.

MANN, W. F., JR.
1968. REINFESTATION OF FOREST SITES BY THE TEXAS LEAF-CUTTING ANT. J. Econ. Entomol. 61: 1460-1461.
New colonies of Atta texana *(Buckley) rapidly reinvade forest areas after old colonies are exterminated. Though the new colonies have a high mortality rate, enough survive and develop to justify annual re-treatment of sites until pine reproduction is 15 feet tall.*

▼MORRIS, R. C.
1962. CARPENTERWORMS GROW FAST IN MISSISSIPPI. Miss. Farm Res. 25(4): 8. *Also as* Miss. Agric. Exp. Stn. Inform. Sheet 760, 2 p.
Most attacks are on trees of low vigor.

Morris, R. C.
1963. Trunk borers in cottonwood. Miss. Farm Res. 26(10): 8, illus. *Also as* Miss. Agr. Expt. Sta. Inform. Sheet 826, 2 pp., illus.
Describes Plectrodera scalator, *the cottonwood borer, and* Saperda calcarata, *the aspen borer.*

▼MORRIS, R. C.
1964. INSECTS OF HARDWOOD NURSERIES. Region 8 Forest Nurserymen's Conferences Proc. 1964: 142-144. U. S. Forest Serv. South. Region.
Short accounts of subterranean, sucking, and defoliating insects common to nurseries, and of host-specific pests of cottonwood, oaks, sweetgum, sycamore, and ash.

MORRIS, R. C.
1965. CONTROLLING INSECT DAMAGE TO SOUTHERN HARDWOOD FORESTS. *In* Insects in Southern Forests, pp. 114-124. Louisiana State Univ. Fourteenth Ann. Forest. Symp. Proc. 1964.
Silvicultural and biological controls are stressed, and supplementary chemical controls are described.

MORRIS, R. C.
1967. BIOLOGY OF GYPSONOMA HAIMBACHIANA (LEPIDOPTERA: OLETHREUTIDAE), A TWIG BORER IN EASTERN COTTONWOOD. Ann. Entomol. Soc. Amer. 60: 423-427, illus.
This insect, the most destructive of those that damage young cottonwoods, develops four or five generations a year. The larvae overwinter in shelters on twigs or in buds.

▼MORRIS, R. C.
1970. WHAT ABOUT HARDWOOD INSECTS? Fifth Forest Insect & Dis. Work Conf. Proc. 1970: 197-201. USDA Forest Serv. State & Priv. Forest. Atlanta, Ga.
The Southern Forest Experiment Station's research on hardwood insects is concentrated on insects affecting the form of young trees, large trunk borers, and defoliators.

▼Morris, R. C., and Orr, L. W.
1963. Caterpillars—fish—trees. Soc. Amer. Foresters Proc. 1962: 172-173.
Tests in river bottoms of southwest Alabama indicated that aerial spraying with ¼ pound of DDT per acre might control the forest tent caterpillar, but there is fear that even this quantity of chemical may injure fish and shellfish.

▼MOSER, J. C.
1962. PROBING THE SECRETS OF THE TOWN ANT. Forests and People 12(4): 12-13, 40-41, illus.
Researchers at Alexandria, La., are studying the biology of the town ant, with a view to improving control measures.

▼Moser, J. C.
1963. Contents and structure of Atta texana nest in summer. Ann. Ent. Soc. Amer. 56: 286-291, illus.
A nest in central Louisiana contained 12 dormancy, 5 detritus, and 93 fungus-garden cavities. The dormancy cavities resembled fungus-garden cavities, but were irregular in shape, the substrate was tightly packed and had a

silage-like odor, and the workers and inquilines in them were torpid.

▼ MOSER, J. C.
1964. INQUILINE ROACH RESPONDS TO TRAIL-MARKING SUBSTANCE OF LEAF-CUTTING ANTS. Sci. 143: 1048-1049, illus.
Nymphs and females of the roach inquiline Attaphila fungicola *W. M. Wheeler respond to odor-trail substances of* Atta texana *(Buckley) and* Trachymyrmex septentrionalis *(McCook). The ants are more sensitive than roaches to the pheromone.*

▼ MOSER, J. C.
1967. MATING ACTIVITIES OF ATTA TEXANA (HYMENOPTERA FORMICIDAE). Insectes Sociaux 14: 295-312, illus.
Swarming occurs in late May, on nights when nest surfaces have been wet by rain. A circadian rhythm triggers swarming at about 3:55 a. m., and most alates leave the nest within 2 minutes.

MOSER, J. C.
1967. TRAILS OF THE LEAFCUTTERS. Natur. Hist. 76 (1): 32-35, illus.
Leafcutting ants make long above-ground trails over which they carry fresh-cut leaf fragments to their underground nests. They mark their trails with a pheromone secreted in a modified poison gland.

▼ MOSER, J. C.
1970. PHEROMONES OF SOCIAL INSECTS. *In* Control of insect behavior by natural products, p. 161-178. WOOD, D. L., SILVERSTEIN, R. M., AND NAKAJIMA, M. (EDS.) N. Y.: Academic Press.
Insects appear to have pheromone receptors that are triggered easily by a specific molecular structure, less easily by closely related structures, and not at all by most molecules. From these receptors, an electrical impulse is transmitted to the central nervous system to release a particular behavior pattern. Though many basic questions are unsolved, the future of pheromones for insect control seems already assured.

▼ MOSER, J. C., and Blum, M. S.
1963. Trail marking substance of the Texas leaf-cutting ant: source and potency. Sci. 140: 1228.
The trail-marking substance of Atta texana (Buckley) is formed in the true poison gland and deposited by the modified sting.

MOSER, J. C., BROWNLEE, R. G., AND SILVERSTEIN, R.
1968. ALARM PHEROMONES OF THE ANT ATTA TEXANA. J. Insect Physiol. 14: 529-535.
Mandibular glands of major workers contain 4-methyl-3-heptanone and 2-heptanone, which act as alarm substances.

MOSER, J. C., AND ROTON, L. M.
1970. TAGGING MITES WITH AEROSOL PAINT. Ann. Entomol. Soc. Amer. 63: 1784.
Small mites can be marked for identification by placing them on a sheet of white paper and spraying them with a nontoxic enamel.

▼ MOSER, J. C., AND SILVERSTEIN, R. M.
1967. VOLATILITY OF TRAIL MARKING SUBSTANCE OF THE TOWN ANT. Nature 215(5097): 206-207.
The trail-marking substance of Atta texana *Buckley contains at least two components, one volatile, the other nonvolatile. Both are followed by workers. The former is potent for about 0.5 hour; the other lasts about 6 days in air and at least 4 months if stored under vacuum.*

▼ ORR, L. W., AND LARA, R. R.
1964. SOUTHERN PINE BEETLE. 5 pp. Addendum to Important Forest Insects of Mutual Concern to Member Countries of the North American Forestry Commission. Compiled by Working Group on Forest Insects and Diseases, North American Forestry Commission, FAO, 1963.
Hosts, life history, description of damage, control.

OSTMARK, H. E., AND BENNETT, W. H.
1969. THIS IS FANNIE FRONTALIS. USDA Forest Serv. South. Forest. Exp. Stn., 19 p. *Also as* ESTA ES MATARILE FRONTALIS. Cent. Reg. Ayuda Tec., Agencia Desarrollo Int. (AID), 22 p. Mexico.
Cartoon booklet on control of southern pine beetle.

SMILEY, R. L., AND MOSER, J. C.
1968. NEW SPECIES OF MITES FROM PINE (ACARINA: TARSOCHELIDAE, EUPALOPSELLIDAE, CALIGONELLIDAE, CRYPTOGNATHIDAE, RAPHIGNATHIDAE, AND NEOPHYLLOBIIDAE). Proc., Entomol. Soc. Wash. 70: 307-317.
Describes several species found on outer bark of Pinus taeda *L. in central Louisiana.*

SMILEY, R. L., AND MOSER, J. C.
1970. THREE CHEYLETIDS FOUND WITH PINE BARK BEETLES (ACARINA: CHEYLETIDAE). Proc. Entomol. Soc. Wash. 72: 229-236.
Two new species of Cheyletid mites, Acarocheyla impolita *and* Cheletogenes acanthus *are described, and* Acarocheyla virginiensis *(Baker) is redescribed.*

▼ SOLOMON, J. D.
1966. ARTIFICIAL REARING OF THE CARPENTERWORM, PRIONOXYSTUS ROBINIAE (LEPIDOPTERA: COSSIDAE), AND OBSERVATIONS OF ITS DEVELOPMENT. Ann. Entomol. Soc. Amer. 59: 1197-1200, illus.
On a diet of oak sawdust, agar, water, and nutrients 59 percent of larvae pupated, and 88 percent of the pupae produced adults. Adults began emerging in 9 months.

SOLOMON, J. D.
1966. TEPA FOR STERILIZING MALE CARPENTERWORMS. J. Econ. Entomol. 59: 1528-1529.
The chemosterilant tepa, applied topically, sexually sterilized males at dosages that neither affected mating vigor nor seriously reduced longevity.

SOLOMON, J. D.

1967. CARPENTERWORM OVIPOSITION. J. Econ. Entomol. 60: 309.

Females nearly always mated and began ovipositing during their first day of adult life. Thirty-two females with a life cycle of 1 year laid an average of 414 eggs; 45 2-year-olds averaged 720. Oviposition lasted 1-7 days but most of the eggs were deposited during the first 24 hours. An average moth laid 90 percent of its egg complement. Incubation for most eggs deposited in the forest during mid-June required 10-11 days, and in the laboratory 11-13 days. Ninety-three percent of egg samples incubated in the laboratory hatched.

SOLOMON, J. D.

1967. REARING THE CARPENTERWORM, PRIONOXYSTUS ROBINIAE, IN THE FOREST (LEPIDOPTERA: COSSIDAE). Ann. Entomol. Soc. Amer. 60: 283-285, illus.

Young larvae are confined individually by small screen cages on host trees.

SOLOMON, J. D.

1967. REGENERATION OF A MANDIBLE IN A LARVA OF THE CARPENTERWORM, PRIONOXYSTUS ROBINIAE (LEPIDOPTERA: COSSIDAE). Ann. Entomol. Soc. Amer. 60: 481-482, illus.

A lost mandible was regenerated to almost normal size in 6 molts.

SOLOMON, J. D.

1968. CERAMBYCID BORER IN MULBERRY. J. Econ. Entomol. 61: 1023-1025.

Larvae of Dorcaschema wildii *Uhler mine large areas of cambium and tunnel into the wood of mulberry trees, often girdling and killing branches or entire trees.*

SOLOMON, J. D.

1968. GALLERY CONSTRUCTION BY THE CARPENTERWORM, PRIONOXYSTUS ROBINIAE, IN OVERCUP OAK (LEPIDOPTERA: COSSIDAE). Ann. Entomol. Soc. Amer. 61: 72-74.

In Mississippi, carpenterworm larvae began feeding in the cambium and then tunneled obliquely upward into the sapwood for about 4 months, and then turned vertically upward. They lengthened and widened their galleries for about 24 months; total lengths were 6 to 9 inches, and diameters averaged 0.6 inch.

SOLOMON, J. D.

1969. WOODPECKER PREDATION ON INSECT BORERS IN LIVING HARDWOODS. Ann. Entomol. Soc. Amer. 62: 1214-1215.

In west-central Mississippi woodpeckers were observed to prey on borers of 14 species. Predation appeared to be greatest during the winter.

▼ SOLOMON, J. D., AND MORRIS, R. C.

1965. WHITE OAK BORER MAJOR HARDWOOD PEST IN MISSISSIPPI. Miss. Farm Res. 28(11): 4, illus.

Life history of Goes tigrinus.

SOLOMON, J. D., AND MORRIS, R. C.

1966. CLEARWING BORER IN RED OAKS. U. S. Forest Serv. Res. Note SO-39, 3 pp., illus.

Paranthrene palmii, *an Aegeriid, damage butt logs by boring into the bases of southern red oaks. The tunnels afford entrance for stain- and rot-producing fungi that further degrade the wood.*

▼ SOLOMON, J. D., AND MORRIS, R. C.

1966. SEX ATTRACTION OF THE CARPENTERWORM MOTH. J. Econ. Entomol. 59: 1534-1535, illus.

Traps baited with females captured an average of 270 males, mostly during the afternoon of the first 3 days after the females emerged. Sizable numbers of marked males were attracted and recaptured from ¼ to 1 mile away.

SOLOMON, J. D., AND TOOLE, E. R.

1968. CARPENTERWORM PUPAE TRAPPED IN GALLERIES BY FUNGUS MYCELIUM. J. Econ. Entomol. 61: 880-881.

Dead pupae were found in mycelium-filled galleries in Nuttall and willow oak.

THATCHER, R. C.

1962. COLD WINTER NO CHECK TO TEXAS PINE BEETLES. U. S. Forest Serv. South. Forest Expt. Sta. South. Forestry Notes 139.

Though temperatures fell to 5°F. in January 1962, southern pine beetle broods were little affected. Infestations in the Big Thicket began to spread during late February.

THATCHER, R. C.

1967. PINE SAWFLY NEODIPRION EXCITANS ROH. U. S. Dep. Agr. Forest Pest Leafl. 105, 4 pp., illus.

Description, life history, controls.

THATCHER, R. C.

1967. WINTER BROOD DEVELOPMENT OF THE SOUTHERN PINE BEETLE IN SOUTHEAST TEXAS. J. Econ. Entomol. 60: 599-600, illus.

Maturation of large numbers of beetles late in winter and high brood survival help explain why populations may increase rapidly in early spring.

THATCHER, R. C., AND PICKARD, L. S.

1964. SEASONAL VARIATIONS IN ACTIVITY OF THE SOUTHERN PINE BEETLE IN EAST TEXAS. Jour. Econ. Ent. 57: 840-842, illus.

Number and size of new infestations increased most rapidly during April, May, and June.

THATCHER, R. C., AND PICKARD, L. S.

1966. THE CLERID BEETLE, THANASIMUS DUBIUS, AS A PREDATOR OF THE SOUTHERN PINE BEETLE. J. Econ. Entomol. 59: 955-957, illus.

The clerid is not a highly efficient control agent for the southern pine beetle.

THATCHER, R. C., AND PICKARD, L. S.

1967. SEASONAL DEVELOPMENT OF THE SOUTHERN PINE BEETLE IN EAST TEXAS. J. Econ. Entomol. 60: 656-658, illus.

It seems likely that, when conditions are favorable, seven generations may develop in a year.

TRIPLEHORN, C. A., AND MOSER, J. C.
1970. TWO NEW SPECIES OF CORTICEUS FROM MEXICO AND HONDURAS (COLEOPTERA: TENEBRIONIDAE). Coleopt. Bull. 24(2): 47-50.
Two new species, Corticeus coynei *and* C. rosei, *were collected as subcortical associates of* Dendroctonus frontalis *Zimm., the southern pine beetle.*

▼WARTER, S. L., MOSER, J. C., and BLUM, M. S.
1962. SOME CORRELATIONS BETWEEN THE FORAGING BEHAVIOR OF COMMON NIGHTHAWKS, CHORDEILES MINOR (FORSTER), AND THE SWARMING BEHAVIOR OF TWO SPECIES OF ANTS, ATTA TEXANA (BUCKLEY) AND IRIDOMYRMEX PRUINOSIS (ROGER). La. Acad. Sci. Proc. 25: 42-46.
Nighthawks ate many of the ants.

WEAVER, J. E., AND SOMMERS, R. A.
1969. LIFE HISTORY AND HABITS OF THE SHORT-TAILED CRICKET, ANUROGRYLLUS MUTICUS, IN CENTRAL LOUISIANA. Ann. Entomol. Soc. Amer. 62: 337-342.
A 16-month study of an insect that sometimes interferes with direct-seeding of pines by foraging seed and clipping needles of newly germinated seedlings.

▼WOODRING, J. P., AND MOSER, J. C.
1970. SIX NEW SPECIES OF ANOETID MITES ASSOCIATED WITH NORTH AMERICAN SCOLYTIDAE. Can. Entomol. 102: 1237-1257.
Describes five new species of Anoetus and one new species of Bonomoia. Previously, only one species of Anoetidae was known to be associated with North American Scolytidae.

YATES, H. O., III, and BEAL, R. H.
1962. NANTUCKET PINE TIP MOTH. U. S. Dept. Agr. Forest Pest Leaflet 70, 4 pp., illus.
Description, life history, control.

PRODUCTS

BEAL, R. H.
1967. FORMOSAN INVADER. Pest Contr. 35(2): 13-17, illus.
Formosan subterranean termites (Coptotermes formosanus *Shiraki) have been found in continental U. S. Soldiers and alates are easy to distinguish from those of native species. Because of their huge reproductive capacity, Formosan termites are potentially more destructive than the native species. Controls are being developed.*

BEAL, R. H.
1969. TREATING PINE LUMBER WITH INSECTICIDE AND PRESERVATIVE PREVENTS TUBING BY SUBTERRANEAN TERMITES. J. Econ. Entomol. 62: 757-758.
Subterranean termites tubed across wood treated with pentachlorophenol or Wolman salts to attack adjacent untreated wood. Addition of insecticide to the preservative prevented such tubing.

▼BEAL, R. H., AND CARTER, F. L.
1968. INITIAL SOIL PENETRATION BY INSECTICIDE EMULSIONS USED FOR SUBTERRANEAN TERMITE CONTROL. J. Econ. Entomol. 61: 380-383.
Insecticide emulsions of chlorinated hydrocarbons penetrated least in arid soils from Arizona and Oregon and most in soil from Missouri.

▼BEAL, R. H., and KAIS, A. G.
1962. APPARENT INFECTION OF SUBTERRANEAN TERMITES BY ASPERGILLUS FLAVUS LINK. Jour. Insect Path. 4: 488-489.
Termites contaminated by spores of the fungus died in 6 to 12 days.

▼BEAL, R. H., AND SMITH, V. K., JR.
1964. PROGRESS REPORT ON GRANULAR FORMULATIONS OF INSECTICIDES FOR CONTROLLING TERMITES. Jour. Econ. Ent. 57: 771.
Five insecticides have been 100-percent effective for 5 years where applied at the following rates per 10 square feet of soil surface: aldrin 0.5 pound, gamma benzene hexachloride 0.9 pound, chlordane 1.0 pound, dieldrin 0.5 pound, and heptachlor 0.5 pound.

▼BEAL, R. H., AND SMITH, V. K., JR.
1965. ARE GRANULAR FORMULATIONS OF INSECTICIDES EFFECTIVE IN SUBTERRANEAN TERMITE CONTROL? Pest Contr. 33(5): 78.
Five insecticides have been 100-percent effective for 5 years where applied at the following rates per 10 square feet of soil surface: aldrin 0.5 pound, gamma benzene hexachloride 0.9 pound, chlordane 1.0 pound, dieldrin 0.5 pound, and heptachlor 0.5 pound.

BEAL, R. H., AND STAUFFER, L. S.
1967. HOW SERIOUS THE FORMOSAN TERMITE INVASION? Forests and People 17(3): 12-13, 28, 40-41, illus.
While Formosan termites have some worrisome characteristics, it is too early to assess their potential importance in the U. S.

CARTER, F. L., AND STRINGER, C. A.
1970. RESIDUES AND DEGRADATION PRODUCTS OF TECHNICAL HEPTACHLOR IN VARIOUS SOIL TYPES. J. Econ. Entomol. 63: 625-628.
Persistence and degradation of heptachlor varied considerably by location in tests in five areas of the U. S. Relatively high values for 1-hydroxy-chlordene, representing about 60 percent of the insecticide in the soil, were obtained for extracts of a Quincy loamy fine sand from Oregon, and significant amounts were found in extracts of Lakeland sand from Florida. Generally, heptachlor epoxide represented only a small fraction of the insecticide in the soils.

CARTER, F. L., AND STRINGER, C. A.
1970. SOIL MOISTURE AND SOIL TYPE INFLUENCE INITIAL PENETRATION BY ORGANOCHLORINE INSECTICIDES. Bull. Environ. Contam. & Toxicol. 5: 422-428.
In columns of soil in a laboratory, depth of penetration by insecticides differed significantly by soil type. In some soils

penetration increased with increasing moisture content, and in some it did not.

CARTER, F. L., STRINGER, C. A., AND BEAL, R. H.
1970. PENETRATION AND PERSISTENCE OF SOIL INSECTICIDES USED FOR TERMITE CONTROL. Pest Contr. 38(10): 18-20, 22, 24, 62.
Soil type, soil moisture content, and climate appear to affect penetration and persistence of insecticides, and therefore may influence effectiveness.

▼Johnston, H. R.
1963. 18 years of soil poison tests. Pest Control 31 (2): 27.
Formulations currently recommended for termite control are 0.5 percent aldrin, 1 percent chlordane, 0.5 percent dieldrin, 0.5 percent heptachlor, and 0.8 percent BHC, all in water emulsion; and 8 percent DDT in oil.

▼JOHNSTON, H. R.
1965. TERMITES. *In* Consumers All, pp. 34-37, illus. U. S. Dep. Agr. Yearbook 1965.
Brief suggestions for preventing or controlling attacks by termites and powder-post beetles.

▼JOHNSTON, H. R.
1968. OFF LIMITS, MR. TERMITE. *In* Science for better living, pp. 260-263. USDA Yearbook 1968.
Chemical soil treatments, developed in research at Gulfport, Mississippi, prevent termite attack on buildings.

▼JOHNSTON, H. R.
1968. RESEARCH PROGRESS REPORT ON FORMOSAN TERMITES. APA Quart., April 1968, p. 11.
A review of knowledge; studies on control are being made.

▼**JOHNSTON, H. R.**
1970. CONTROL OF WOOD PRODUCTS INSECTS. Fifth Forest Insect & Dis. Work Conf. Proc. 1970: 169-172. USDA Forest Serv. State & Priv. Forest. Atlanta, Ga.
Under most circumstances, roundwood in mill yards, lumber in drying yards, and wood in use can be protected from insect attacks. There are currently no satisfactory substitutes for the insecticides aldrin, chlordane, dieldrin, and heptachlor for prevention of subterranean-termite damage.

▼KING, E. G., JR., AND SPINK, W. T.
1969. FORAGING GALLERIES OF THE FORMOSAN SUBTERRANEAN TERMITE, COPTOTERMES FORMOSANUS, IN LOUISIANA. Ann. Entomol. Soc. Amer. 62: 536-542.
The gallery system of a nest excavated near Lake Charles covered about 1.4 acres. Trees attacked included dead baldcypress, dead pine, live waxmyrtle, and live Chinese tallow.

▼MATSUMURA, F., COPPEL, H. C., AND TAI, A.
1968. ISOLATION AND IDENTIFICATION OF TERMITE TRAIL-FOLLOWING PHEROMONE. Nature 219: 963-964.
The trail-laying compound of Reticulitermes virginicus *has been identified and synthesized as n-cis-3, cis-6, trans-8-dodecatriene-1-ol. The substance is closely related, if not identical, to an attractive substance produced by western white pine* (Pinus monticola *Dougl.) rotted by the fungus* Lenzites trabea.

▼MORRIS, R. C.
1964. "GREASE SPOT" IN OAK—BLEMISH OR BEAUTY? South. Lumberman 208(2592): 23, 26, illus.
The markings called grease spots are made by larvae of a small beetle, Agrilus acutipennis. *Grease-spotted logs are not suitable for factory lumber but can be sawn into attractive paneling.*

MORRIS, R. C.
1964. VALUE LOSSES IN SOUTHERN HARDWOOD LUMBER FROM DEGRADE BY INSECTS. U. S. Forest Serv. Res. Paper SO-8, 6 pp., illus.
In mill-scale studies, insect-caused defects in the trunks of living southern oaks resulted in lumber degrade and loss in value averaging about $20 per M bd. ft.

▼NEEL, W. W., AFFELTRANGER, C. E., AND BEAL, R. H.
1966. RADIATION-PROCESSED WOOD-PLASTIC COMBINATIONS CURB SUBTERRANEAN TERMITE ATTACKS. Pest Contr. 34(7): 36, 38-40, illus.
First-year results in stake tests indicate that wood impregnated with plastics is somewhat resistant to termites.

▼SMITH, V. K., JR.
1965. PROTECTING LOGS, BOLTS, AND CHIPS FROM INSECTS. *In* Insects in Southern Forests, pp. 125-129. Louisiana State Univ. Fourteenth Ann. Forest. Symp. Proc. 1964.
Timber may be sprayed with or dipped in BHC formulations, stored under water, or sprinkled with water. Pulpmills also have the alternative of chipping their wood before storing it.

SMITH, V. K.
1968. LINDANE CONTROLS LYCTUS POWDER-POST BEETLES DURING AIR-DRYING OF ROUGH ASH LUMBER. J. Econ. Entomol. 61: 323-324.
Dipping boards in a 0.06 percent emulsion of lindane in water will protect them during air-drying from powder-post beetles and ambrosia beetles.

SMITH, V. K.
1968. LONG-TERM MOVEMENT OF DDT APPLIED TO SOIL FOR TERMITE CONTROL. Pesticides Monit. J. 2(1): 55-57.
The DDT has moved very slightly during 2 decades of weathering in an open field in southern Mississippi.

SMITH, V. K.
1969. TERMITE CONTROL AND THE NATURAL ENVIRONMENT. Brit. Wood Preserv. Assoc. Termite Symp. Proc. 1969: 101-104 *Reprinted by* Shell Int. Chem. Co., Ltd., 3 pp.

Chlorinated hydrocarbon insecticides applied to the soil to control subterranean termites have moved very slightly after 10 to 20 years of weathering in open fields in southern Mississippi.

Smith, V. K., Jr., and Johnston, H. R.
1962. EASTERN SUBTERRANEAN TERMITE. U. S. Dept. Agr. Forest Pest Leaflet 68, 7 pp., illus.
Description and suggestions for control.

Smith, V. K., Tynes, J. D., and Tynes, K. E.
1969. MAINTAIN YOUR OWN TERMITE COLONY. Pest Contr. 37(5): 30, 32.
Termite colonies can easily be kept in glass jars containing moist, well-aged pine sawdust.

Smythe, R. V., and Carter, F. L.
1969. FEEDING RESPONSES TO SOUND WOOD BY THE EASTERN SUBTERRANEAN TERMITE, RETICULITERMES FLAVIPES. Ann. Entomol. Soc. Amer. 62: 335-337.
Of 11 species of wood, baldcypress and redwood were the least favored by termites, slash and loblolly pine the most. Termite mortality was greatest on redwood and black walnut.

Smythe, R. V., and Carter, F. L.
1970. FEEDING RESPONSES TO SOUND WOOD BY COPTOTERMES FORMOSANUS, RETICULITERMES FLAVIPES, AND R. VIRGINICUS (ISOPTERA: RHINOTERMITIDAE). Ann. Entomol. Soc. Amer. 63: 841-847.
Two southern pines and sugar maple were preferred over several other woods. Given a choice, the termites concentrated on the preferred woods and made little distinction among any of the others. In tests with loblolly pine and baldcypress there was marked tree-to-tree variation in susceptibility to attack.

Smythe, R. V., and Carter, F. L.
1970. SURVIVAL AND BEHAVIOR OF THREE SUBTERRANEAN TERMITE SPECIES IN SAWDUST OF ELEVEN WOOD SPECIES. Ann. Entomol. Soc. Amer. 63: 847-850.
Sawdust from western larch and sugar maple gave best overall survival.

▼Smythe, R. V., and Coppel, H. C.
1966. A PRELIMINARY STUDY OF THE STERNAL GLAND OF RETICULITERMES FLAVIPES (ISOPTERA: RHINOTERMITIDAE). Ann. Entomol. Soc. Amer. 59: 1008-1010.
The sternal gland, responsible for the secretion of a trail-laying substance, lies in the fifth abdominal segment underneath an elongated fourth abdominal sternite. The gland is composed of globose, vacuolated cells and elongate, camponiform sensillae-like processes.

▼Smythe, R. V., and Coppel, H. C.
1966. PATHOGENICITY OF EXTERNALLY OCCURRING FUNGI TO RETICULITERMES FLAVIPES. J. Invertebrate Pathol. 8: 266-267.
Eight fungal species were isolated from the external body surface of 50 termites. The fungi caused termite mortality varying from 5-100 percent when termites were exposed for 5 minutes to plates of sporulating fungi.

▼Smythe, R. V., Coppel, H. C., and Allen, T. C.
1967. THE RESPONSES OF RETICULITERMES SPP. AND ZOOTERMOPSIS ANGUSTICOLLIS (ISOPTERA) TO EXTRACTS FROM WOODS DECAYED BY VARIOUS FUNGI. Ann. Entomol. Soc. Amer. 60: 8-9.
R. flavipes *and* R. virginicus *responded to aqueous extracts of wood rotted by several fungi.*

▼Smythe, R. V., Coppel, H. C., Lipton, S. H., and Strong, F. M.
1967. CHEMICAL STUDIES OF ATTRACTANTS ASSOCIATED WITH RETICULITERMES FLAVIPES AND R. VIRGINICUS. J. Econ. Entomol. 60: 228-233, illus.
Western white pine wood rotted by Lenzites trabea *was a richer source of attractant than the substances secreted by the termites themselves.*

MISCELLANEOUS

▼Briegleb, P. A.
1962. FORESTRY PROGRESS IN THE SOUTH—A REPORT. Forest Farmer 22(3): 6-8, 15-17, illus.
Over the past 6 years technical forestry has made important gains in the South.

▼Briegleb, P. A.
1963. Progress made in technical forestry in the South. Soc. Amer. Foresters Proc. 1962: 5-9.
While considerable progress has been made, more attention will have to be paid to utilization and marketing, protection from insects and diseases, economics, engineering and mechanization, wildlife habitat, watershed, and recreation management. "In every discipline, we need to increase the relative effort applied to hardwoods."

▼Croker, T. C., Jr.
1962. LONGLEAF PINEY WOODS LABORATORY. Ala. Forest Prod. (Dir. ed.) 5(10): 17, 19-20, illus.
Research at the Escambia Experimental Forest.

▼Fassnacht, D. L.
1969. WOOD SCIENCE IN THE MIDSOUTH COMES OF AGE. First South-Cent. Reg. Seminar, Gulf South Res. in Wood Proc., pp. 1-2.
The scope and depth of wood research in the region has expanded greatly during the last decade.

Johnson, R. L., and Little, E. L., Jr.
1967. TREES, SHRUBS, AND WOODY VINES OF THE BLUFF EXPERIMENTAL FOREST, WARREN COUNTY, MIS-

SISSIPPI. U. S. Forest Serv. Res. Pap. SO-26, 14 pp., illus.

Botanical list of 97 species, with notes on silvical characteristics of tree species.

▼JOHNSTON, H. R.

1967. UPDATE ON RESEARCH AT USDA'S FOREST SERVICE GULFPORT LABORATORY. Pest Contr. 35(11): 41-42, illus.

This laboratory, the only one in the U. S. devoted exclusively to study of insects that attack wood, is seeking improved means of preventing damage by termites and powder-post beetles.

KENNEDY, H. E., JR.

1969. THE SOUTHERN SWAMPLANDS: POTENTIAL TIMBER BONANZA. Forests and People 19(3): 34-35.

The Southern Forest Experiment Station is seeking ways to manage timber in swamps such as the Atchafalaya Basin of Louisiana.

▼MCKNIGHT, J. S.

1962. HORIZONS IN HARDWOODS. Forest Farmer 21(8): 14-15, 28-29, illus.

Survey of current research projects in the South, the most important research needs, and what may be expected from research in years to come.

▼MCKNIGHT, J. S.

1964. HARDWOOD RESEARCH IN THE SOUTH. Jour. Soil and Water Conserv. 19: 77-78, illus.

Brief account of research at the Southern Hardwoods Laboratory.

▼MCKNIGHT, J. S.

1964. SOUTHERN FORESTRY INCLUDES HARDWOODS. Auburn Forestry Forum Proc. 1963: 30-35. Ala. Agr. Expt. Sta.

More than a third of southern forest land will probably yield its greatest multiple benefits if devoted permanently to hardwoods.

▼MCKNIGHT, J. S.

1967. THE LESS THAN HARDY HARDWOODS: RESEARCH TO REGENERATE THEM. The Changing Middle South, No. 3, pp. 24-26, illus.

Briefly describes research at the Southern Hardwoods Laboratory.

MCKNIGHT, J. S.

1967. THE SOUTHERN HARDWOOD CHALLENGE. Southern Lumberman 215(2680): 134-136, illus.

If the Nation is to have enough southern hardwood timber, marketing must be improved and forest management and research intensified.

▼MCKNIGHT, J. S., and CARPENTER, B. E., JR.

1962. HARDWOOD HELPS ALABAMA FORESTRY. Ala. Forest Prod. (Dir. ed.) 5(10): 58-59, 61-62, illus.

Accumulated knowledge about management, if applied as effectively as it is to pines, could benefit the economy more than it has. Research is developing new information on breeding oaks and gums, restraining the forest tent caterpillar, and safeguarding stored logs.

▼MAISENHELDER, L. C., and MCKNIGHT, J. S.

1962. SOUTHERN HARDWOOD RESEARCH: PAST—PRESENT—FUTURE. South. Lumberman 205(2561):122-123, illus.

Research at the Southern Hardwoods Laboratory.

▼MIGNERY, A. L.

1964. HARDWOOD AND FOREST SOILS RESEARCH AT SEWANEE. KTG Jour. 4(3): 4-5, illus.

Soil-tree relationships and artificial regeneration of hardwoods are the main subjects of research by the Timber Management Project in Tennessee.

▼MIGNERY, A. L.

1967. NEW SILVICULTURE LABORATORY SERVES THE MID-SOUTH. Southern Lumberman 214(2663): 20, 22, illus.

The attractive wood-and-stone building at Sewanee, Tennessee, houses U. S. Forest Service scientists who are seeking improved ways of growing timber on the Cumberland Plateau and Highland Rim.

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INDEX OF AUTHORS

Affeltranger, C. E. 93
Ahlrich, V. E. 76
Alcaniz, R. 68
Allen, R. M. 2, 29,32,38
Allen, T. C. 94
Amburgey, T. L. 85
Anderson, A. E. 70
Anderson, W. C. 39, 40
Andrew, L. E. 71
Arganbright, D. G. 51
Avery, T. E. 61

Bailey, R. L. 79
Baird, A. W. 12
Baird, C. O. 40
Baker, J. B. 61
Barber, J. C. 27
Barefoot, A. C. 28
Barnes, H. M. 51, 52
Barnett, J. P. 14, 15, 19, 23, 31, 38
Barras, S. J. 86, 89
Barrett, J. P. 29
Bassett, J. R. 5, 38, 71, 72, 74, 76
Beal, J. A. 87
Beal, R. H. 87, 92, 93
Beaufait, W. R. 2
Beene, J. T. 71
Beland, J. W. 34
Beltz, R. C. 45, 46, 48
Bengtson, G. W. 29
Bennett, N. C. 76
Bennett, W. H. 87, 90
Bensend, D. W. 51
Bercaw, T. E. 33
Bertelson, D. F. 46
Bertrand, A. L. 12, 13, 44
Biesterfeldt, R. C. 15, 23, 26, 46, 59, 88
Bilan, M. V. 15, 72, 75
Bingham, R. T. 33
Blackmon, B. G. 38, 72
Blair, R. M. 61, 65, 67
Blaisdell, J. P. 64
Blocker, W. W. 12, 61, 76
Blomquist, R. F. 51
Blum, M. S. 87, 90, 92
Bohannan, B. 56
Bonner, F. T. 24, 25, 26, 34, 72, 73
Bormann, F. H. 39
Bouler, T. P. 14, 52
Bower, D. R. 5, 61, 63, 72, 76
Boyd, C. E. 68, 70
Boyer, W. D. 5, 15, 16, 29, 38, 64, 72
Brady, H. A. 9, 10, 11
Brendemuehl, R. H. 61, 72
Briegleb, P. A. 61, 94
Briscoe, C. B. 25
Broadfoot, W. M. 8, 9, 25, 34, 72, 73
Brownlee, R. G. 90
Brunett, L. 67
Burley, J. 31
Burns, E. B. 20
Burns, P. Y. 10
Burns, R. M. 2, 16, 23, 25, 73, 88
Burton, J. D. 5, 10, 14, 16, 61, 73, 75
Byrnes, W. R. 77

Campbell, R. S. 64
Campbell, T. E. 16, 29, 34
Campbell, W. A. 79
Carpenter, B..E., Jr. 51, 52, 85, 95
Carpenter, R. D. 56
Carter, F. L. 92, 93, 94
Carter, M. C. 10, 75
Cassady, J. T. 16
Chapman, R. C. 5
Chappell, T. W. 52
Choong, E. T. 51, 52, 53
Christopher, J. F. 45, 46, 47, 48, 49, 50, 51, 52
Cole, L. W. 12
Collicott, L. V. 6
Coppel, H. C. 93, 94
Cordero, A. D. 87
Cost, N. D. 50
Cote, W. A. 52
Covell, R. R. 73, 74
Coyne, J. F. 61, 88
Craul, P. J. 73
Crawford, H. S. 66, 67
Croker, T. C., Jr. 2, 5, 6, 16, 17, 79, 94
Cutchins, M. A. 20
Czabator, F. J. 14, 79, 81, 82, 84

Daniel, H. E. 4
Darwin, W. N., Jr. 37, 52, 60
Davidson, R. W. 79
Davis, K. P. 61
Davis, R. T. 79
Day, A. C. 52
Dell, T. R. 6, 61, 62, 80
Dendy, F. E. 78
Derr, H. J. 6, 17, 20, 29, 31, 61
Dickerson, B. E. 12
Dickerson, B. P. 75, 76
Dietz, D. R. 70
Dinus, R. J. 29
Dodge, W. G. 61
Doolittle, M. L. 12
Dorman, K. W. 27, 33
Duerr, W. A. 40
Duffy, I. T. 2, 52
Duffy, P. D. 17, 76
Duke, W. B. 4, 66
Durso, D. F. 52
Dutrow, G. F. 40, 45
Duvall, V. L. 64, 65, 66

Earles, J. M. 45, 46
Echols, H. W. 88
Echols, R. M. 33
Eleuterius, L. N. 79, 80, 82
Eneim, R. C. 73
Enghardt, H. G. 6, 61
Epps, E. A., Jr. 66, 67, 68
Erickson, H. D. 52
Evans, D. D. 77
Evans, S. R. 29
Evans, T. C. 65

Fahnestock, G. R. 12, 13, 72
Farmer, R. E., Jr. 2, 25, 34, 35, 36, 37, 38
Farrar, R. M., Jr. 6

Fasick, C. A. 40, 41, 43
Fassnacht, D. L. 47, 50, 52, 53, 94
Fedkiw, J. 61
Ferguson, E. R. 2, 5, 13, 17, 20, 73
Filer, T. H., Jr. 79, 80, 81, 84
Fletcher, P. W. 76
Fogg, P. J. 53
Fowler, J. F. 69, 70
Freese, F. 61
Froelich, R. C. 80, 82

Gammage, J. L. 25
Golley, F. B. 70
Goodrum, P. D. 22, 68, 70
Graney, D. L. 73
Grano, C. X 2, 6, 10, 14, 17, 61, 74, 88
Green, W. E. 69
Grelen, H. E. 4, 65, 66
Griessman, B. E. 13
Grigsby, H. C. 30, 88
Grosenbaugh, L. R. 61
Guenther, W. B. 73
Gunter, E. R. 46
Guttenberg, S. 2, 40, 41, 42, 43, 44, 45, 50, 53, 61
Gwinner, M. W. 13

Halls, L. K. 10, 61, 64, 65, 66, 67, 68, 69, 71
Hamaker, J. M. 29, 32
Hamann, D. D. 52
Hansard, S. L. 65
Hansbrough, T. 19, 44
Hare, R. C. 13, 30, 39
Harrell, A. 70
Harrington, T. A. 53
Harris, R. W. 64
Harvey, G. 85
Hatchell, G. E. 18
Hay, C. J. 88
Hays, J. A. 67
Hebb, E. A. 2
Hedlund, A. 9, 45, 46, 47, 50
Heffernan, W. D. 12
Henry, B. W. 27, 30, 80
Hermann, H. R. 88
Herrington, L. P. 13
Hilmon, J. B. 65
Hinds, T. E. 79
Hitchings, R. G. 28
Hodges, J. D. 18, 62, 73, 74, 86, 89
Holley, D. L., Jr. 41, 42
Hollis, J. P. 14
Homesley, W. B. 68
Hopkins, W. C. 52, 53, 63
Horne, W. H. 85
Hosner, J. F. 73
Howard, E. T. 53
Hse, C. Y. 53, 66
Hudson, F. M. 53
Hudson, M. S. 53
Hughes, R. H. 66
Hunt, A. N. 88
Hunter, P. E. 89
Hyde, J. M. 85

Ifju, G. 53
Ike, A. F. 9, 73

Janssen, P. 50
Jenkinson, P. 56
Jewell, F. F. 30, 80, 81, 82, 85
Johnson, A. W. 65
Johnson, R. L. 2, 3, 9, 10, 25, 26, 94
Johnston, H. R. 93, 94, 95
Jones, A. R., Jr. 12, 13
Jones, C. A. 21, 42
Jones, E. P., Jr. 31
Jones, L. 34
Jorgensen, J. R. 18, 22, 73
Judson, G. M. 45, 48, 62

Kais, A. G. 81, 82, 92
Kaiser, H. F., Jr. 40, 42
Kaufman, H. F. 12
Kearney, N. S., Jr. 26
Kennedy, H. E., Jr. 26, 95
Ketcham, D. E. 87
King, E. G., Jr. 93
Kleppe, P. J. 53
Knight, H. A. 50
Knight, S. J. 72
Koch, P. 53, 54, 55, 56, 60
Koshi, P. T. 18
Krinard, R. M. 9, 10, 26, 36, 84
Krumbach, A. W., Jr. 74

Lara, R. R. 90
Laundrie, J. F. 56
Lawrence, R. V. 56
Lawson, E. R. 2, 76
Lay, D. W. 68
Ledig, F. T. 39
Lemoine, T. J. 56, 58
Leonard, R. G. 67, 69
Linnartz, N. E. 38, 65, 66
Lipton, S. H. 94
Little, E. L., Jr. 94
Lockard, C. R. 56
Loftus, N. S. 27
Lohrey, R. E. 18, 62
Loos, W. E. 58
Lorio, P. L., Jr. 62, 73, 74, 81, 89
Lull, H. W. 76

McCarty, J. D. 68
McClurkin, D. C. 18, 39, 73, 74, 76, 78
McClurkin, I. T. 39
McCoy, G. L. 69, 70
McCracken, F. I. 80, 81
McDaniel, A. R. 71, 72
McGregor, W. H. D. 29
McIlhenny, R. C. 51
McKee, W. H., Jr. 74
McKnight, J. S. 2, 3, 9, 26, 36, 40, 56, 73, 95
McLemore, B. F. 15, 18, 19, 31
McLeskey, H. M. 13
McMillin, C. W. 56, 57, 58
MacNaughton, V. B. 8
McReynolds, R. D. 16
Maisenhelder, L. C. 3, 4, 25, 26, 36, 95
Mallett, S. L. 30, 81
Mann, W. F., Jr. 4, 15, 17, 19, 20, 89
Manwiller, F. G. 51, 53, 56, 58
Maple, W. R. 2, 4, 20, 74
Martin, J. W. 10
Martin, R. E. 58
Matsumura, F. 93
Mauldin, J. K. 89
Medin, D. E. 70
Melder, T. W. 29
Mergen, F. 31
Merrifield, R. G. 14
Mesavage, C. 2, 62, 63, 76
Meyer, J. A. 58
Meyer, M. P. 76

Mignery, A. L. 4, 6, 14, 21, 26, 27, 31, 95
Miller, H. A. 69
Miller, D. L. 28
Miller, H. R. 61
Moehring, D. M. 4, 6, 20, 74
Moak, J. E. 45
Mohn, C. A. 35, 36
Monroe, W. M. 67
Morgan, H. P. 64
Morris, R. C. 4, 88, 89, 91, 93
Morrow, J. P. 63
Moser, J. C. 87, 88, 89, 90, 92
Moslemi, A. A. 58

Namkoong, G. 27, 28, 31, 33, 63
Nance, W. L. 36
Naylor, A. W. 38
Neel, W. W. 93
Neelands, R. W. 7, 27, 28, 95
Nelson, M. E. 49
Nelson, T. C. 7, 42, 51, 63, 76, 95, 96
Newsom, J. D. 69, 70
Nichols, A. C. 50
Nixon, E. S. 69
Nolan, W. J. 58

O'Carroll, J. P. 12
Oefinger, S. W., Jr. 68, 69, 71
O'Regan, W. G. 65
Orr, L. W. 89, 90
Ostmark, H. E. 87, 90
Owen, H. M. 73

Packard, R. L. 22
Pearson, H. A. 67
Peevy, F. A. 10, 11
Pennington, R. E. 69
Perkins, C. J. 69
Pickard, L. S. 87, 91
Plass, W. T. 75
Pleasonton, A. 42
Popham, T. W. 77, 78, 82
Powers, H. R., Jr. 81, 82
Punch, L. E. 96
Putnam, J. A. 9, 56, 96

Rainer, R. K. 53
Ralston, C. W. 72, 74
Randall, W. K. 36
Rawls, I. W. 7, 74
Reagor, J. C. 70
Reifsnyder, W. E. 13, 14
Remmenga, E. E. 70
Reynolds, R. R. 7, 42
Richardson, B. Y. 20, 52, 58, 59
Ripley, T. H. 69
Robinson, H. F. 33
Robinson, J. H. 59
Robinson, J. W., Jr. 12
Robinson, V. L. 50
Robinson, W. J. 20
Rogerson, T. L. 77
Rollins, G. V. 27
Roncadori, R. W. 82
Roton, L. M. 90
Row, C. 42, 43, 44
Royall, W. C., Jr. 20
Rummell, R. S. 66
Rumsey, R. L. 59, 96
Rush, E. S. 59
Russell, T. E. 14, 21, 26, 27, 36

Sampson, G. R. 40
Scarbrough, N. M. 31, 32, 38
Scheer, R. L. 4, 18, 21, 82
Scheffer, T. C. 85, 86
Scheld, H. W. 85
Schmidtling, R. C. 22, 31
Schmitt, D. M. 29, 31, 36, 63
Schneider, G. 75
Schultz, T. J. 59
Schuster, J. L. 66, 69
Scott, O. J. 79
Segelquist, C. A. 69, 70, 71
Shadowen, H. E. 21
Shelbourne, C. J. A. 63
Shields, C. A. 96
Short, H. L. 69, 70
Shoulders, E. 7, 14, 18, 21, 22, 32, 74, 81
Siegel, W. C. 43, 44, 63
Silverstein, R. M. 90
Smalley, G. W. 27, 63, 75, 82
Smiley, R. L. 90
Smith, H. D. 22, 32
Smith, J. L. 75, 76
Smith, L. F. 2, 4, 6, 11, 22, 32
Smith, R. P. 59
Smith, V. K., Jr. 92, 93, 94
Smythe, R. V. 94
Snow, G. A. 79, 80, 81, 82
Snyder, E. B. 28, 29, 31, 32, 33, 63
Solomon, J. D. 90, 91
Sommers, R. A. 92
Sorrels, S. S. 82
South, D. R. 44
Southern Forest Experiment Station 29, 71, 96
Southwell, B. L. 66
Spalt, K. W. 13, 14
Spink, W. T. 93
Sproull, R. C. 59
Squillace, A. E. 28, 32, 33
Stairs, G. R. 31, 36
Stanley, R. G. 59
Stauffer, L. S. 92
Stearns, F. W. 71
Stephenson, G. K. 18, 22, 29, 77
Stern, E. G. 59
Sternitzke, H. S. 4, 45, 46, 47, 48, 49, 50, 51, 67
Stevens, R. R. 59
Stokes, C. M. 59
Stonecypher, R. W. 28
Stranskey, J. J. 4, 17, 22, 69, 71, 72, 75
Stringer, C. A. 92, 93
Strong, F. M. 94
Suchsland, O. 59
Suddarth, S. K. 59
Sweet, H. C. 85
Switzer, G. L. 30, 33

Tabor, H. B. 59
Tai, A. 93
Taylor, H. T., Jr. 20, 53, 58, 59, 60, 96
Taylor, M. L. 13
Teeguarden, D. E. 40
Terry, T. A. 32
Thames, J. L. 22, 33, 77
Thatcher, R. C. 91
Thompson, W. S. 60
Toole, E. R. 4, 14, 37, 79, 80, 81, 82, 83, 84, 85, 91
Trevelyan, B. J. 60
Triplehorn, C. A. 92
True, R. P. 81
Turk, J. 69
Tynes, J. D. 94
Tynes, K. E. 94

Ursic, S. J. 22, 23, 77, 78

Van Hooser, D. D. 47, 51
Van Sickle, C. C. 45, 46, 47, 48, 51, 63
Van Zandt, J. 85
Venketeswaran, S. 85
Verrall, A. F. 79, 81, 84, 85, 86
Vozzo, J. A. 4

Wahlgren, H. E. 52
Wakeley, P. C. 7, 8, 23, 33, 34, 60, 84
Walker, N. M. 81, 85
Walkinshaw, C. H. 80, 81, 84, 85
Wangaard, F. F. 60
Ward, F. B. 71
Ward, F. D. 69
Warter, S. L. 92
Wasser, C. H. 66
Watterston, K. G. 73
Weaver, J. E. 92
Webb, C. D. 36, 37
Welch, G. D. 12
Welch, R. L. 51
Weldon, D. 60
Wellons, J. D. 60
Wells, O. O. 6, 30, 31, 33, 34
Wenger, K. F. 39
Whaley, R. S. 44, 45
Wheeler, P. R. 45, 63
Whitaker, L. B. 65, 67
White, D. P. 74
White, E. H. 75
Wiant, H. V., Jr. 68, 71
Wilcox, J. R. 36, 37, 63
Williams, D. L. 63
Williamson, B. C. 4
Williamson, M. J. 96
Williston, H. L. 8, 11, 23, 24, 75, 78
Wilson, D. R. 4, 22, 75
Wilson, R. H. 22
Wolters, G. L. 67
Woodring, J. P. 92
Woods, F. W. 4
Woodson, G. E. 56, 60

Yarlett, L. L. 65
Yates, H. O. III 92
Yocom, H. A. 8, 11, 12, 24, 63
Yoho, J. G. 45
Youngs, R. L. 96

Zahner, R. 39, 75
Zicherman, J. B. 60
Zillgitt, W. M. 4, 96

B5 24 2